

Call into the platform!

Merging platform grammatisation and practical knowledge to study digital networks

Call into the platform! Gramatización de la plataforma y el conocimiento práctico para estudiar redes digitales

Call into the platform! Fundindo a gramatização da plataforma e o conhecimento prático para estudar redes digitais

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Abstract

This paper introduces a medium-specific research perspective as fundamental basis for Social Sciences and Communication fieldwork. It points to the importance of combining knowledge on platform grammatisation with data research practices (capture, mining, analysis and visualization) to study digital networks. That is what we refer to as call into the platform; an effort to account for the technical fieldwork and digital methods in an interdependent position to research. In this conception, and through the case of Portuguese Universities on Facebook, we interrogate how digital networks contribute to the research contexts of communication and social sciences studies. To respond to this question, two distinctive digital networks were explored, shedding light in the institutional connections and the visual culture of the higher education in Portugal. The first comprises all connections made by a given Page - the act of liking other pages or being liked in return (Page like network). The second is built upon the affordances of computer vision APIs - the connections between images and their descriptive labels (Page timeline image-label network). Beyond providing new ways to design and implement research that can be repurposed for different studies, the main contribution of this study lies in embracing the methods of the medium as key component for digital social sciences.

Key Words: *Social media research; Facebook; Digital methods; Image-label network; Portuguese universities; Vision API*

Resumen

Este artículo presenta una medium-specific research perspective como base fundamental para el trabajo de campo de Ciencias Sociales y Comunicación. Basándose en el ejemplo de las posibilidades de las redes digitales, señala la importancia de combinar el conocimiento sobre la gramatización de la plataforma con las prácticas de investigación de datos. Esto es lo que llamamos call into the platform. Asumimos el trabajo de campo técnico como algo que tiene una posición inter-dependiente en la investigación de las ciencias sociales digitales. Este artículo presenta el caso de las universidades portuguesas en Facebook, un estudio que interroga cómo las redes digitales contribuyen con la investigación en comunicación. Para responder a esta pregunta, exploramos dos redes distintivas que evidencian sobre las conexiones institucionales y la cultura visual de

la educación superior en Portugal. La principal contribución de este artículo radica en adoptar los métodos del medium como clave para las ciencias sociales digitales.

Palabras clave: *Investigación en redes sociales; Facebook; Métodos digitales; Portugal; Vision apis; Redes digitales*

Resumo

Este artigo introduz uma investigação específica do meio (medium-specific research) como base fundamental para o trabalho de campo de Ciências Sociais e Comunicação. A partir das affordances de redes digitais, aponta para a importância de combinar os conhecimentos sobre gramatização das plataformas com as práticas de pesquisa com dados. O artigo apresenta o caso das Universidades Portuguesas no Facebook, e questiona como as redes digitais podem favorecer os estudos de comunicação. Para responder a esta questão, exploramos duas redes distintas que esclareceram as ligações institucionais e a cultura visual do ensino superior em Portugal. Primeiro, a rede de gostos que compreende todas as conexões feitas por uma determinada página. A segunda rede é construída sobre as possibilidades da visão computacional e retrata as conexões entre as imagens e seus rótulos descritivos. A principal contribuição deste artigo é a realização de um exercício prático que reimagina a tecnicidade das redes como componente fundamental para o estudo da comunicação institucional no Facebook.

Palavras chave: *Mídia social; Facebook; Métodos digitais; Visão computacional; API; Redes digitais*

1. Introduction

Three visions of approaching the digital have been modelling research in the field of Social Sciences and Communication. The mastering of online questionnaires, surveys and interviews to enquiry our digital life comprise the first. Although taken as key research methods, the proposal of migrating the social sciences instrumentarium to online does not properly respond to the affordances of digital platforms and data (Rogers, 2015; Marres, 2017). A second vision conforms mixed methods or what Marres (2017) refers as an affirmative approach to grasp the digi-

tal; to treat “digital devices as an empirical resource for enquiry” (p.125) and also to affirm the role of bias in processes like issue formation. Despite well-suited for online environment, this vision remains focused on the instrumental capacities of the *digital*, just as the first one. For both cases, the appreciation of technology is somehow broken and thus not taken seriously as “hybrid assemblages” (Latour, Jensen, Venturini, Grauwin, & Boullier, 2012). Conversely, this paper foregrounds “the medium-specificity of social phenomena” (Marres, 2017, p. 117); when digital platforms are both object and method of study (Latour et al., 2012).

We bypass the so-called *digitization* of methods and opt for the deployment of online mechanisms, tools and data for conducting social or medium research (Rogers, 2013; 2015; Marres, 2017). This introduces the third vision for approaching the digital - *from the inside out*; the incorporation of *the methods of the medium* to reimagine social and medium research (Rogers, 2019). In this line of thought, we account web platforms as *sociological machines* (Marres, 2017) that are qualified by digital instruments for data capture, analysis and feedback. Consequently, we consider digital infrastructures, with Marres (2017) and Rogers (2019), as promoters of *methodological innovation*.

Drawing on the case of Portuguese Universities on Facebook, this paper points to the importance of combining knowledge on platform grammatisation with data research practices (capture, mining, analysis and visualization). It furthermore considers the notion of grammatisation (Gerlitz & Rieder, 2018; Omena, Rabello & Mintz, 2020) as a path to understand how social media delineated, (re) organise and structure online activity through software, e.g. social media application programming interfaces (APIs). That is what we refer to as *call into the platform*, which points to the functional understanding of web platforms as a fundamental basis for Digital Social Sciences and Communication. There is thus a requirement on technical layers of knowledge about the platform itself entangled with digital methods perspective (Rieder, 2015; Rogers, 2019).

The proposal of calling into the platform to study digital networks, therefore, envisions the infrastructural aspects of Facebook and its forms of grammatising online activity. One way of understanding Facebook grammatisation is to grasp how its Graph API delineate predefined forms of activities and their specific properties. From the existence of a Facebook Page and related metadata¹ to very pecu-

liar characteristics, e.g. what a given page “is” by informing the “page category” (e.g. College & University). In platform functionality and comprehension, we ask what one can learn from the connections between Facebook pages (through likes) and from a list of (timeline) image URLs.

We further raise questions on the affordances and limitations of Facebook as source for digital Social Sciences research through the exercise of reading digital networks. What can be studied from single page like connections? What can we foresee from a historical dataset of images featured in Facebook Pages timeline? How to reimagine platform grammatisation to study the institutional communication of Portuguese Universities? To address these challenges, two distinctive networks² will be explored shedding light in the institutional connections and the visual culture of the higher education in Portugal. These networks emerge from different situations: one afforded by Facebook Graph API (the like network of Facebook Pages) and another afforded by digital data (the timeline image-label network³). The first (see Fig 1) comprises all connections made by a given page; the act of liking other pages or being liked in return (a monopartite network). The second is built upon the affordances of computer vision APIs in describing large images datasets, and the advantages of software and data for building and plotting a network of images and their descriptive labels (a bipartite network).

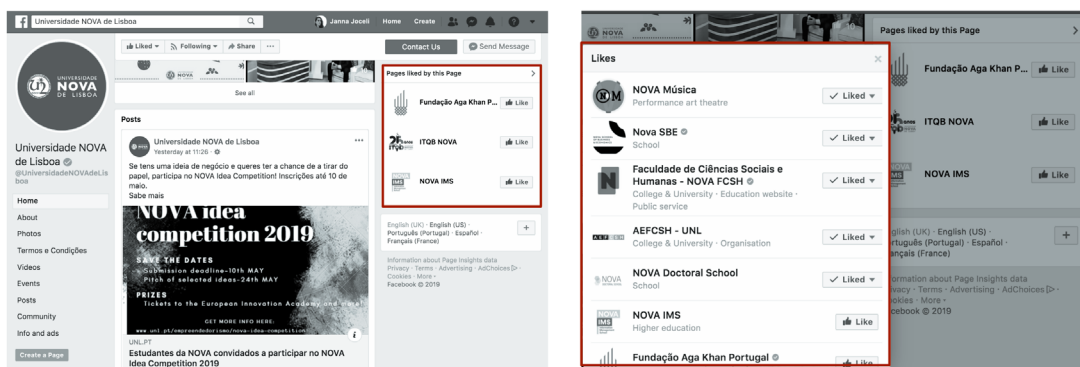


Figure 1: The act of liking other pages in Facebook end-user interface.

Given this scenario, we take the visual affordances of networks and data relational nature as an analytical framework (Venturini, Jacomy, Bounegru, & Gray, 2018; Venturini, Jacomy, & Pereira, 2015; Venturini, Jacomy, & Jensen, 2019; and Omena, Chao, Pilipets et al. 2019). Thus, overlooking statistical metrics, we argue with Venturini and Rogers (2019), that digital social sciences research *through* web platforms, should always be research *about* these platforms. That is to say: one cannot study society through a web platform without studying the platform itself. In what follows we operationalise research *about* Facebook as a form of grasping the institutional connections and visual culture of Portuguese Universities *through* this platform.

2. Material and Methods

The material presented in this paper is part of a larger research project about the Portuguese Universities on Facebook, which started in March 2017. Since then, and following the advantages of API research (Venturini & Rogers, 2019), the public page metadata of the 14 public universities in Portugal and one private (see Table 1) have been collected and archived through the application Netvizz⁴ (Riederer, 2013). The list of 15 universities complies with the Council of Deans of Portuguese Universities – CRUP, that lists all Portuguese Public Universities and the Portuguese Catholic University (the oldest private higher education institution in Portugal). CRUP represents more than 80 percent of all students enrolled at Portuguese universities.

Facebook Page ID was the entry point for data collection, advanced by the Netvizz modules Page Like Network and Page Timeline Images. Table 1 shows the number of extracted pages for each Like Network (crawl depth 1), with data extraction on March 2019, and the number of all timeline images collected. This latter dataset is a substantial and representative sample because it brings together all images uploaded by the 15 Portuguese Universities: from each page created time to March 2018.

Page Created Time	University	Page ID	Extracted pages from Page Like Network Module	Number of extracted images from Timeline Images Module
Feb 2009	Universidade do Porto	51541308379	69 pages	1272 images
Sep 2009	Universidade da Beira Interior	143419211198	42 pages	1719 images
Mar 2010	Universidade Católica Portuguesa	342519554742	16 pages	528 images
Sep 2010	Universidade de Aveiro	114882798568553	23 pages	1055 images
Oct 2010	Universidade de Coimbra	159654804074269	4 pages	66 images
Apr 2010	ISCTE – Instituto Universitário de Lisboa	116726201675273	152 pages	616 images
Jan 2011	Universidade de Trás-os-Montes e Alto Douro (UTAD)	110296129010034	391 pages	7054 images
Mar 2011	Universidade do Algarve	190354481008389	528 pages	279 images
Feb 2011	Universidade do Minho	111501795592752	121 pages	2731 images
May 2011	Universidade Aberta de Portugal	157257697673304	128 pages	982 images
Jan 2012	Universidade Nova de Lisboa	331782250179584	33 pages	365 images
Feb 2012	Universidade de Lisboa	263694373699158	53 pages	562 images
Nov 2012	Universidade de Évora	398588126903994	149 pages	2772 images
Feb 2014	Universidade dos Açores	1696811123898577	1 pages	1813 images
Jul 2014	Universidade da Madeira	590410784413143	48 pages	784 images
Total of pages and images:			1.758 pages	22.598 images

Table 1: List of Portuguese Universities according to Facebook Page IDs, created time by Facebook Page Transparency, and the outputs of data extraction through Netvizz⁵.

The research design visual protocol⁶ is explained as follows (Figure 1). The entry points for collecting data were page ids. Through calling the Facebook Graph API, Netvizz returns both tab. and gdf. files that contains metrics and data afforded by Facebook Platform (e.g. Reactions button, post published date, comments). Some of these metrics were attached to node attributes (e.g. page category, post-activity, fan count, talking about count) or edge property (the act of like connects pages) within the like network, others facilitated the process of building up an image network (e.g. a list of image URLs). For data analysis and visualization we used Ge-

phi (Bastian, Heymann, & Jacomy, 2009), and Graph Recipes⁷, for the image-label network we relied also on python scripts: one for interfacing with Google's Vision API⁸ and other for plotting images into svg. files, the Image Network Plotter⁹.

For the automated image content analysis, the option was Google's Vision API due to its descriptive capacities which tend to higher levels of specificity when labelling large image datasets, and when compared with other vision APIs such as IBM or Microsoft (Mintz et al., 2019). To analyse 22,594 images generated by Portuguese Universities, two particular properties of Google's computer vision API were chosen: the description of images and the detection of face expressions - namely *label* and *face detection*. For this latter, RawGraphs (Mauri, Elli, Caviglia, Uboldi, & Azzi, 2017) and ImageSorter¹⁰ served as important tools to analyse, navigate and visualise the results related to face detection.

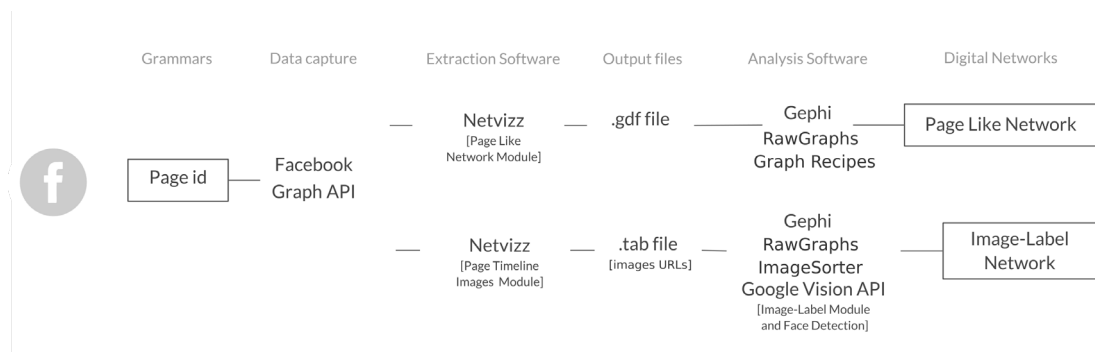


Figure 2: Research protocol diagram: combining the knowledge of platform grammatisation with the praxis of data capture and data analysis for studying Portuguese Universities Digital Networks.

For the scrutiny of the two distinctive digital networks (page like and image-label networks), we relied mostly on visual network analysis (Venturini et al., 2015; 2019; Omena, Chao, Pilipets et al. 2019). This approach draws our attention to the visual affordances of the networks, rather than focusing only on statistical metrics. The position, size and colour of nodes are fundamental aspects in this analytical process, as well as the spatialization of the network, here provided by

ForceAtlas2. This force-directed algorithm, commonly used for studying networks emerged from social media, helps in the interpretation of data by creating a balance state in the spatialization of the network (Jacomy, Heymann, Venturini, & Bastian, 2014). Modularity calculation (Blondel, Guillaume, Lambiotte, & Lefebvre, 2008) was also used to identify clusters: the detection of institutional interests within the like network and the different modes of visual representations within image-label networks. Adding to that, we took into account a critical framework for reading digital networks (Omena & Amaral, 2019) which simultaneously reflects technical-practical knowledge on platform grammatisation, the narrative affordances of ForceAtlas2 and Gephi software.

3. Results

Seeing beyond like connections

The analysis of Portuguese Universities Page like network is organised according to an overview of the page's profile, institutional connections and the narrative thread afforded by the spatialization of the network; by looking at its whole and parts as well as the central and bridging nodes (Latour et al., 2012; Venturini et al., 2019; Omena & Amaral, 2019). The question of clusters' formations is also addressed, moving to an in-depth analysis of page categories as a path to unveil the universities specific (institutional) interests.

Starting with a general overview, the scatterplot below (Figure 2) displays different Facebook metrics (variables) attached to a given university (nodes). Through the size of nodes, we see that Facebook typical forms of measurements can be very contradictory if taken as analytical parameters. For instance, a high degree of *post activity* may not relate with users' engagement - *talking about count* (see the universities of UTAD, Coimbra and Algarve). In the same token, the number of *fan count* (see Aberta). In other words, a high degree of activity or number of fans not necessarily indicates high levels of engagement. Additionally, we see that more than a half of the universities allow users to post (green nodes), but these publications are kept hidden from their Page timeline.

An overview of Portuguese Universities on Facebook
 Facebook Pages | Platform Grammatization | March 2019

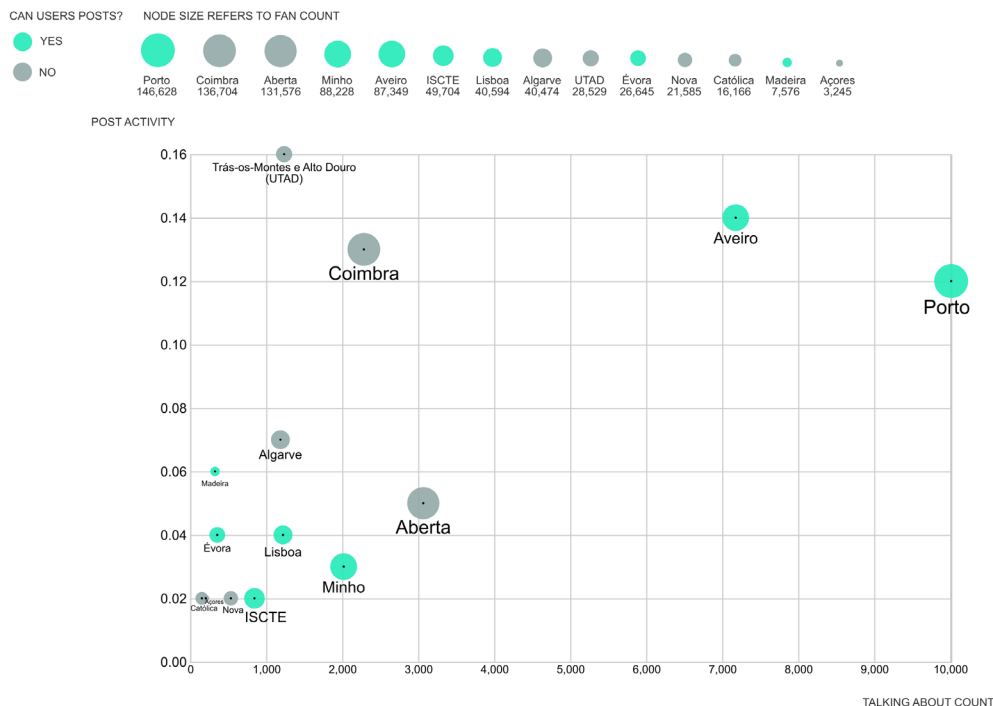


Figure 3: An overview of Portuguese Universities according to the following Facebook metrics: post activity (posts per hour and based on the last 50 posts); talking about count (attention metric); users can post (whether a page allows users to publish posts on the page); fan count (number of likes a page has received). Scatterplot made in RawGraphs and edited in Inkscape.

When moving towards the heat map of the Portuguese Universities page like network (Figure 4), we first notice that Media and News Companies (see the nodes among Público and Expresso), followed by the Foundation Calouste Gulbenkian, at the heart of the interests of this network. A second aspect corresponds to a high density of connections that surrounds UTAD and Algarve universities and, with a lower density; ISCTE, Porto, NOVA e Lisboa. A third aspect concerns Madeira University which is detached from the main component within the network and, ironically, geographically isolated. Madeira is an island located in Funchal part of the Maderian archipelago. Following the positioning of the nodes, one final

observation relates to the central role of Universia Portugal (an academic Portal), European Commission, Forum Estudante (an academic and professional-oriented magazine) and the Association of Portuguese Speaking Universities (AULP).

The exercise of replacing edges with a density heat map provides a vision of the whole network and signalise the matters of common concern among Portuguese Universities (Media and News Journal); pointing also to agglomerations (clusters) and central actors.

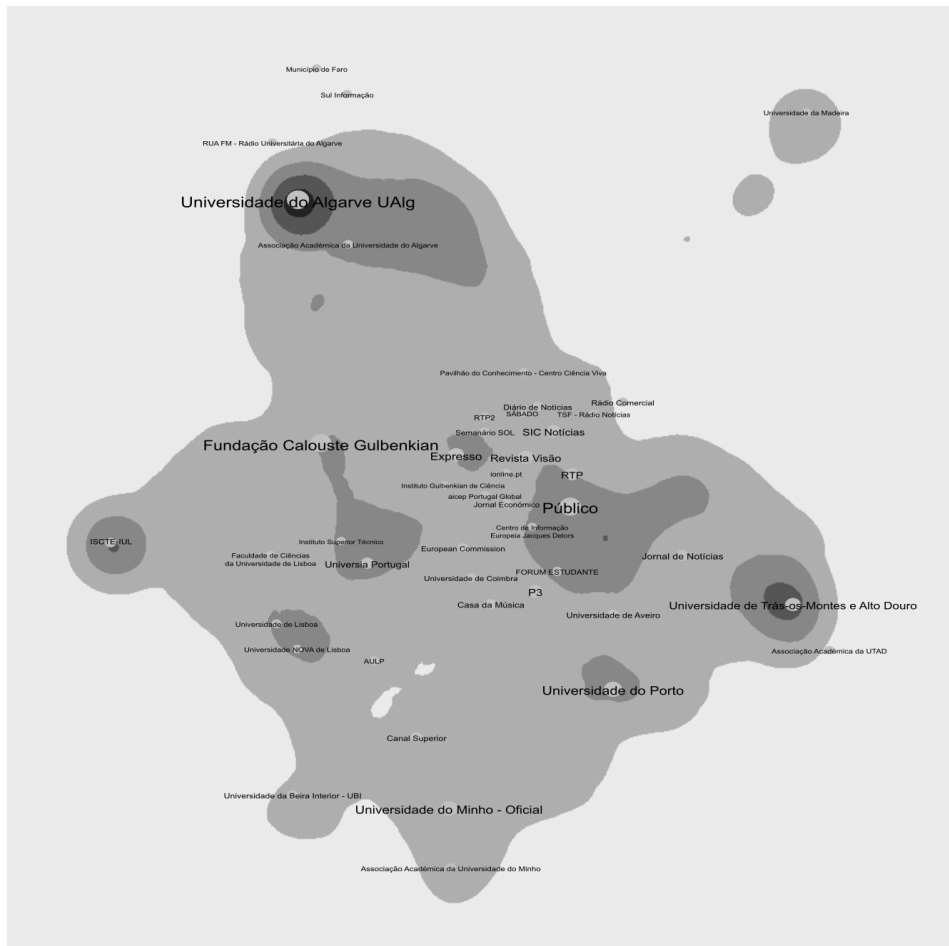


Figure 4: The heatmap of Portuguese Universities page like network corresponding to March 2019. The networks show 44 visible nodes (out of 1.522) and it contains 18.988 edges. Node size by indegree. Visualization by Graph Recipes (Heatmap dessert) and Gephi.

While recognising the value of the nodes positioned in the centre of the network (under the categories of Media/News Company and Newspapers), these nodes were removed with the intention to better visualise clusters. For instance (see Fig. 5), the emergence of three small clusters attached to the universities of Aveiro, Beira Interior and Minho. Furthermore, new central actors for Portuguese Universities were detected: the General Direction of Portuguese Higher Education, MIT Portugal Program (an international collaboration centre), FNAC Portugal and Futurália (the biggest Education Fair in Portugal). After that, we read the spatialisation of the network through the visual affordances of ForceAtlas2¹¹. In the centre of the network, we see the very connected pages that have a key role to the whole network, while influential actors and bridging nodes¹² take part in the mid-term field. For instance, the Portuguese television and radio channels (e.g. RTP2, SIC TV, Rádio Comercial), AULP and the job opportunities office as bridging nodes. In the mid-term, small clusters can be seen with connections mainly related to Porto, Nova, Lisboa and Évora universities.

In the periphery (Fig. 5), while the large holes denote less connections with the centre or mid-term zones, the existence of clusters correspond to the particular interests of Algarve, UTAD, Minho, Beira Interior and ISCTE. For instance, faculties, laboratories, student associations, schools. As an isolated element, Madeira only takes part of the network due to the *likes* the page has received from a medical service and a high school Facebook Pages. Madeira university itself has only connected to pages featured by “Portugueses in...” or “Portuguese immigrants in...”, evoking to the presence of Portugueses in European, South America and African cities or countries. Those are, somehow, unexpected connections for an official higher-education Institutional Facebook Page.

Throughout the observation of the shape of edges in large and small clusters, a visual pattern is identified suggesting how clusters are formed. An outward movement from the central node to its neighbours alludes to the fact that cluster formation is substantially based on the act of liking (see Algarve, UTAD and ISCTE in Fig. 5). To confirm the visual hypothesis, we invoked degree centrality to analyse cluster formation within the page like network: by sizing nodes according to the number of connections made by a page (degree), and the total of likes a page received (indegree) or made (outdegree).

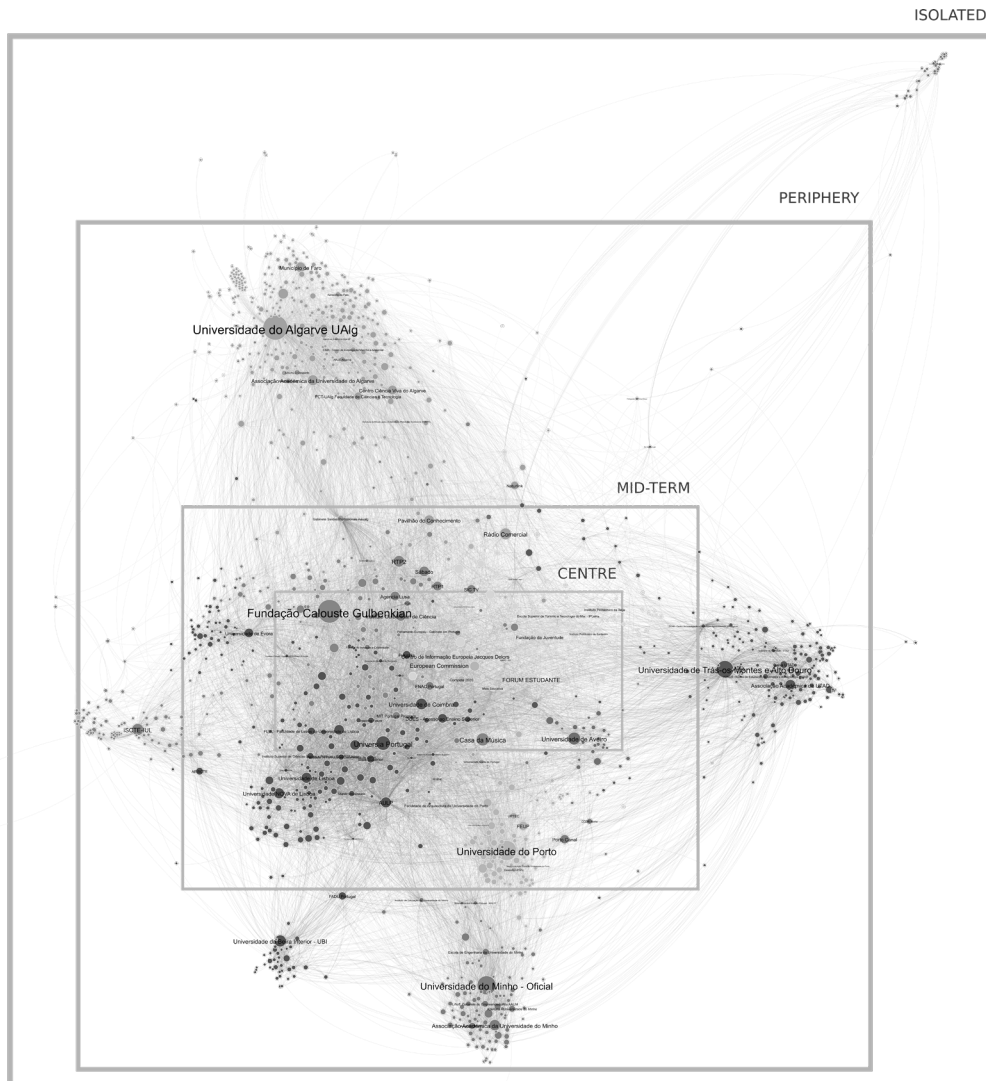


Figure 5: Reading the page like network of Portuguese Universities according to the narrative thread afforded by the force directed layout ForceAtlas2. The nodes categorised by Media/News Company and Newspapers were removed in order to highlight cluster formation and to see the universities particular interests. 1.426 nodes, 16.125 edges. Node sized by degree.

We thus reimaged page likes (table 2) to define whether cluster formation is based on page activity (by means of liking pages), reciprocity (by a balanced number of likes made vs. received), popularity (by means of receiving likes), or little

reciprocity. In so doing, we avoid misinterpretation in the process of interpreting digital networks, e.g. taking larger clusters as more important or overseeing the role of hidden elements.

Algarve has the largest cluster mainly because it has liked more than 500 pages. In contrast, the small cluster of Minho is based on reciprocal connections, while Porto seems to be very popular among other institutional Facebook Pages. When accounting for how connections are made within a network (data relational nature), node size or visibility should only inform different characteristics that serve as basis for understanding the cluster formation and its narrative thread.

Clusters/Page	Indegree [liking pages]	Outdegree [receiving likes from pages]	Formation based on
Universidade do Algarve	178	527	Page activity [by means of liking pages]
Universidade de Trás-os-Montes e Alto Douro	117	390	
Universidade de Évora	54	148	
Universidade Aberta de Portugal	19	127	
ISCTE	75	151	
Universidade do Minho	131	120	Reciprocity [by balanced number of likes received and made]
Universidade de Lisboa	66	52	
Universidade Católica Portuguesa	37	15	
Universidade do Porto	140	68	Popularity [by means of receiving likes]
Universidade de Aveiro	81	22	
Universidade da Beira Interior	75	41	
Universidade NOVA de Lisboa	66	33	
Universidade da Madeira	2	47	Little reciprocity

Table 2: Analysing cluster formation and nodes size on the basis of in-degree and out-degree.

After understanding cluster formation, the Facebook parameter Page Category¹³ served as form of identifying the interests of Portuguese Universities (see Fig. 6) within the network. Not surprisingly, College & University, School, Community, Non-profit Organization, Community College, High School, Government Organization, and Media/News Company are the dominant categories within the network. Page category also reveals multiple dimensions of sociality: media and communi-

cation (TV, radio, newspaper, website); culture (museums, library, art, musician/ band); business (company, consulting or advertising or marketing agency, agriculture service); public services and health concerns (medical and health, hospital); entertainment (golf course and country, cultural centre, movie theatre) and gastronomy (Thai restaurant, dessert shop); public figures and news personality. Even very specific interests like Barbershop, Car Dealership, Shopping Mall, Sports League and Events. However, when searching for political related categories, civic engagement, social movements or causes, nothing was found.

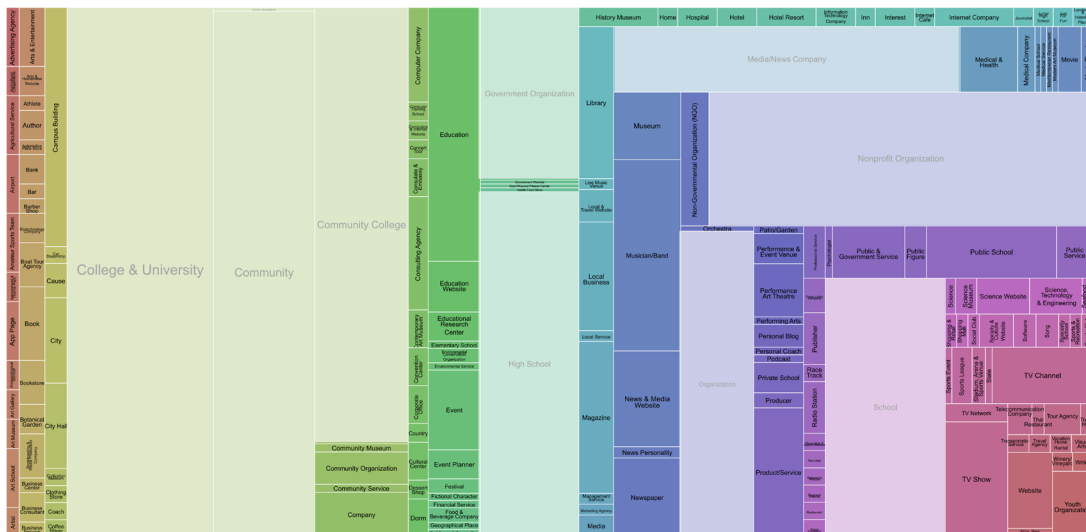


Figure 6: What are the dominant (highlighted in white) and ordinary (in colour) associations linked to Portuguese Universities? Treemap of Page Categories: size refers to the frequency of appearance.

Back to the mainstream categories, and driven by College & University and School, three groups that stand for the institutional profile and specific interests of each university were detected:

1. Schools from varied districts/regions of Portugal; with especial attention to school groups (Algarve and UTAD), polytechnic institutes (Évora), university departments or services (Minho).

2. Internal stakeholders; faculties, institutes, departments, research centres, and courses from each university. For instance, Coimbra, Lisboa and NOVA focus on their faculties or institutes, meanwhile Aveiro pays more attention to departments, Beira Interior to students' nuclei from different courses, and Católica to courses including its branches in Porto and Braga.
3. International universities and Portuguese higher education¹⁴ exclusively represented by ISCTE – IUL, and local learning centres.

Contrasting with this description, Aberta University is uniquely positioned in combination of the three groups due to its balanced range of connectivity. Another affordance of looking at page categories is unfolding official pages that are set aside by the university or the other way around. A good example is the lack of connection between Coimbra University and its Department of Physics, The geophysical and astronomical laboratory, The geophysical and astronomical laboratory, Rádio Universidade de Coimbra, and others¹⁵. Additionally, the discovery of pages oriented towards specific audience, e.g. Brazilians students¹⁶.

The imagery of Portuguese Universities

What can we foresee from a historical dataset of Facebook images timelines? How to repurpose the methods of the medium to study the visuality of higher education in Portugal? As natively digital objects, online images have uniform resource identifiers (URLs) that often provides a fragment component preceded by a = (equal sign) which points to a unique identifier (id) of a given image, such as https://scontent.flis9-1.fna.fbcdn.net/v/t1.0-9/1937274_144956263379_7335679_n.jpg?_nc_cat=108&_nc_ht=scontent.flis9-1.fna&oh=2a719e0099e71e-4049305a22ea628887&oe=5D536D7D. By taking advantage of the image's URLs afforded by Facebook Graph API and merging these into the computer vision services of Google Cloud API, we were able to describe and interpret the imagery of Portuguese Universities.

A total of 22.594 images were plotted in a bipartite network, in which nodes are images (90.62%) and labels (9.38%), while edges (161.474 in total) show the connections made by a number of labels that describe one or more images. The

co-occurrences of similar descriptive visual content (labels) informs the position of the images within the network. In alignment with Rose's (2016) proposal for interpret visual material, the first level of analysis enquires about the site of the image itself. The multi-sited composition and meanings indicate different formations of institutional interests that are invested in the visuality of the page timelines. What visualities describe this culture? What the dominant visualities and their inherent meanings can tell? What is not there (and why)? Through the computer vision API-based network, in Figure 7, we see the plot of all images featured in the timeline of the 15 Portuguese Universities Facebook Pages, and spatialised according to correlated labels. At the bottom, the analytical exercise of relabelling the machine vision by categorising clusters. In what follows we will present how the scrutiny of timeline images can provided general and specific insights on the visual culture of Portuguese Universities over the years, more precisely from each university page created time to March 2018.

In Figure 7, at the top, we see a quite homogeneous network; except from the strong concentration of images in dark hues on the right side and the colourful agglomeration at the top. These clusters represent the most common visual representation associated with Portuguese Universities official Facebook Pages: *Portugal sentado* (Portugal while seated) and *posters*. The former is named after a Portuguese journalistic expression that relates to the (bad) habit of publishing photos of people seated in press conferences, auditoriums, all kinds of meetings, parliament, scientific conferences, or even sports events. In order words, something to be avoided in the newspapers. *Posters* depict all sort of written content: screenshots of news, institutional newsletter, banners to promote academic events or to celebrate commemorative dates.

In the peripheral zone of the image-label network, the formation of discrete clusters that points to different visualities with a more detailed classification (labels) to describe the images, whereas a more generic labelling takes place in the centre of the network. After analysing the different regions of the network, ten clusters were detected beyond those two already mentioned (see Fig. 7): *people in academic events*, *people in outdoor/indoor events*, *school buildings*, *head shot pictures*, *sports*, *musical performance*, *sky and grass*, *animals*, *labs*, and *history in black and white*.

The imagery of Portuguese Universities on Facebook
Facebook Pages | Timeline Images | Google Vision API
Image Network | 22.594 images | 2009 - 2018 | Clusters

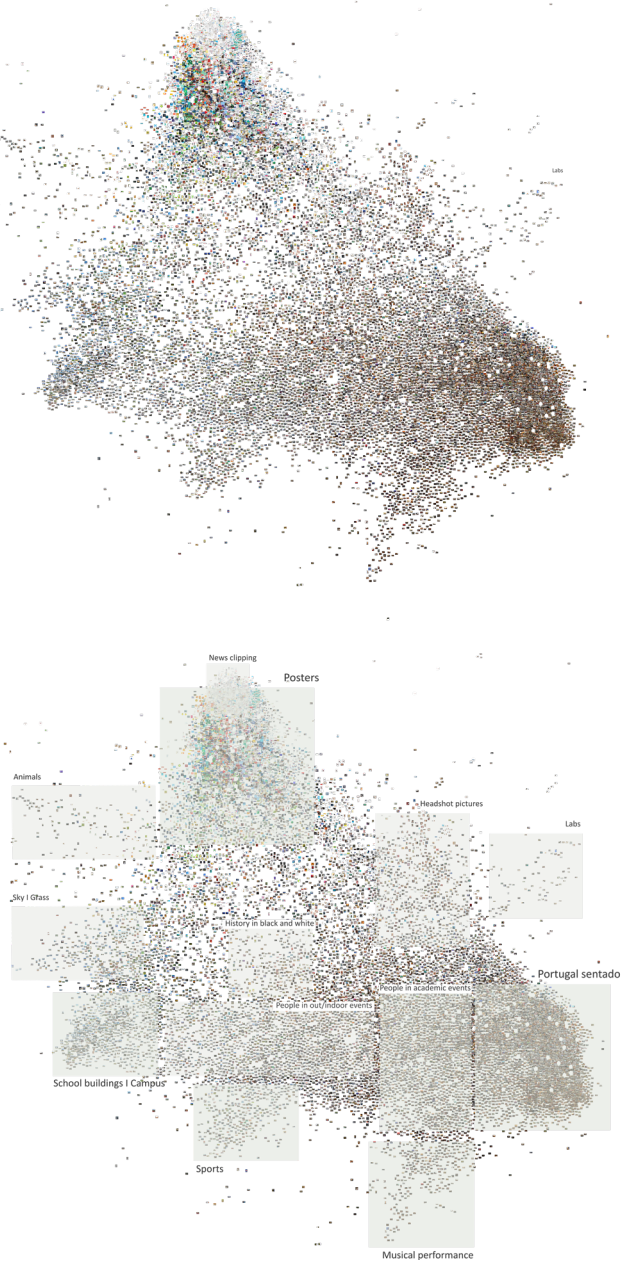


Figure 7: The imagery of Portuguese Universities on Facebook from 2009 to 2018.

In a general view (Fig. 8), the visual depiction of Portuguese Universities mainly outlines the tedious pictures of audiences (sitting in an auditorium) or keynote speakers in academic conferences. Adding to that, pre and post conference conversations, organizers or participants posing to pictures, posters presentations, institutional partnership (e.g. hands shaking or signing contracts) and prize winners. Next to *portugal sentado* and nearly the center of the network (Fig. 7), there are two other clusters which main focus is *people in academic events* (outdoor and indoor activities); also, small and big groups chatting or posing for photo, professors or students being interviewed.

Another strong visual identity is the graphical depiction of posters and banners with the most varied type of announcements. Beyond conference, symposiums, workshops, sports or new students related banners, number of likes achieved by a page (fan count), and the celebration around the 'international day of' (e.g. water, statistics). A very particular visuality is also uncovered; that is news clipping which indicates how Portuguese Universities value when mainstream or traditional Portuguese newspapers headlines or mentions academic research, professors or students. In this scenario, and between 2009 and 2018, we may infer that the dominant visualities of Portuguese Universities conform to people attending events and institutional posters.

The architecture of *school buildings* earned a place of honour, in particular the overwhelming presence of Institute of Social Sciences (ICS) of Minho University (Fig. 8). We also visualise *head shot pictures* of local, national and international researchers (perhaps a few number of students), and a full cluster dedicated to university *sports* (Fig.8). From collective (including wheelchair categories) to individuals' modalities, the rule seems to be the depiction of victorious teams; images of teams celebrating the victory, athletes on the podium, holding medals or a trophy. At the bottom of the network, the *musical performance* cluster (Fig. 7), composed by cultural events in the shape of concerts, choirs, orchestra and musicians with their instruments. There is also a group of images putting together because *sky and grass* are their main visual composition.



Figure 8: *The visual history of Portuguese Universities from 2009 to 2018: image tree map based on clusters detected in the image-label network (portugal sentado, posters, people in academic events, people in outdoor/indoor events, school buildings, head shot pictures, sports, musical performance, sky and grass, animals, labs, and history in black and white).*

The ordinary visual content (less substantial in numbers) brings wild and domestic *animals* such as birds, caws, awls, tigers, monkey, dogs and cats; the stereotype images of labs - namely researchers working with a telescope; and people who made *history in black and white* pictures. This latter, therefore, basically represents historical photos published by Porto. The visual description and historical perspective of Portuguese Universities seem to lack, however, the everyday life of students and non-stereotypical imagery of scientific research, while it overvalued the academic events and institutional communication through banners and news clipping.

Portuguese Universities | Facebook Pages | Timeline Images
 Google Vision API | Image-Label Network

From page created time to March 2018
 White nodes: labels | Colored nodes: images

■ Portugal sentado
 ■ Posters
 ■ People | Events
 ■ Musical performance
■ Sports
 ■ Animals
 ■ Head shot pictures

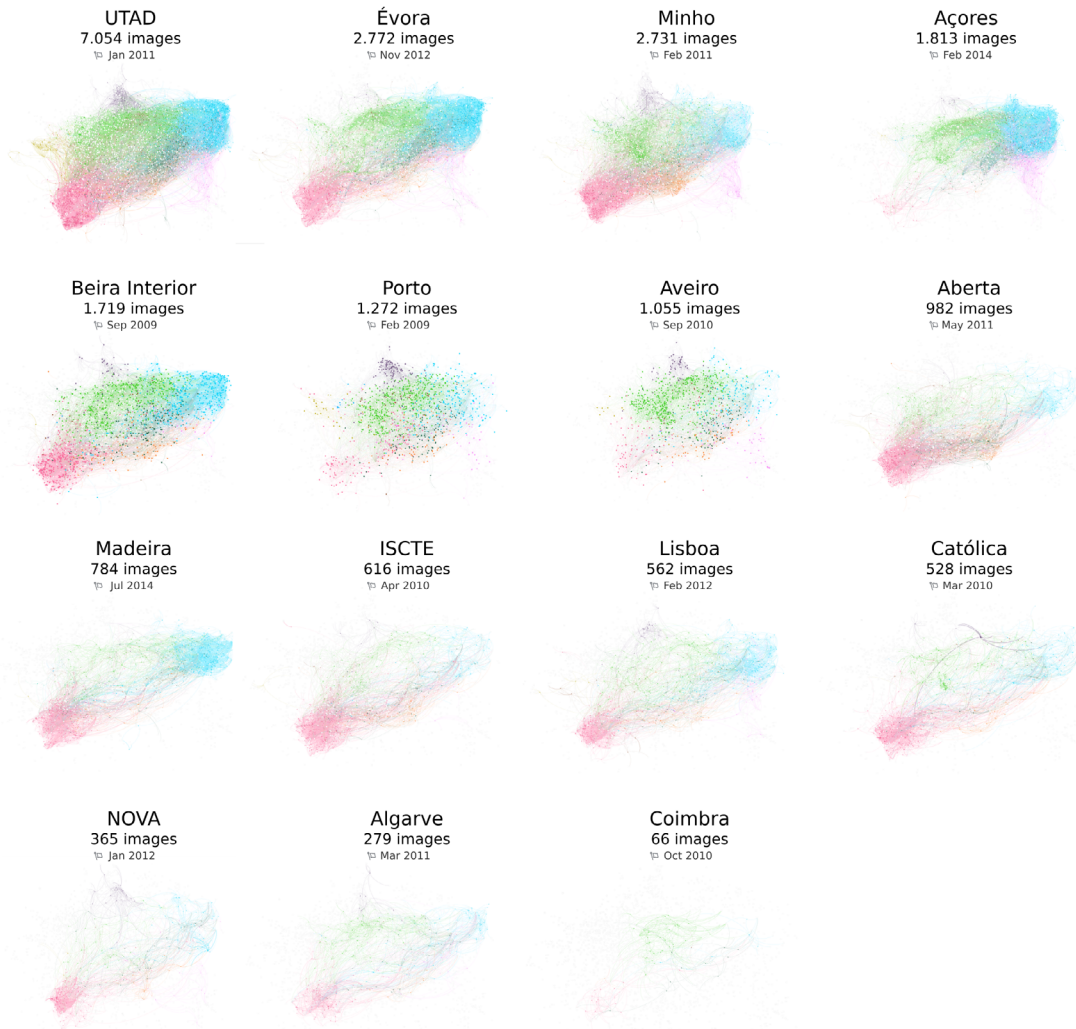


Figure 9: Vision API-based network grid. Seeing the visual patterns of a given Portuguese University from its page created time to March 2018.

After having a general (but also detailed) perspective on the imagery of Portuguese Universities on Facebook, in the second level of analysis, we questioned about the visual choices and patterns attached to each university. Fifteen bipartite image-label networks were arranged in a grid to respond to this question (Fig. 9). The focus of our analytical observations here is on the presence or absence of colours, which indicates different visual patterns and particularities. In the grid, for each university image-label network there is the number of images in accordance with the page created time. These individual characteristics helps in to situate different networks. The vision API-based network grid provides not only an innovative technique to approach Portuguese Universities' timeline images but their visual history on Facebook.

As previously described, pictures of sitting audiences, posters and people in academic conferences, correspond to the dominant imagery of the majority of Portuguese universities on Facebook – with exception of Coimbra University. In contrast to this portrayal, the practice of *sports* and *musical performance* appear to have little visual space among universities, at least if compared with the main images' categories. For instance, there is a minor representation in Açores, Lisboa and Católica and no visual mention in Madeira. Aberta University does not contemplate sport practices. Particular characteristics can be seen through the *animals* cluster which is almost exclusively to UTAD but also represented in Porto and, on a minor scale, in Aveiro. The *head shot pictures* seems to please all universities, except in the case of Açores, Madeira, Coimbra; these latter do not invest in such style. The vision API-based network grid (Fig. 9) offers an effective and direct way of reading the choices and patterns that constitute the imagery of Portuguese University on Facebook. Such technique can be replicated for other similar studies.

Since *people* is at the core of the visual communication, the last level of analysis took advantage of the face detection module made available by Google Vision API. The main objective was to repurpose machine vision to assess the mood of Portuguese higher education. Results demonstrate an overwhelming depiction of happiness along the years, but also detect other face expressions such as *surprise*, *sorrow* and *anger* (see Fig. 10). In terms of consistency, and considering the page created time, Porto, Minho, Aveiro, ISCTE and Madeira have recursively publishing images

that contain *joy* in their respective Facebook Pages. Whereas, in terms of volume and duration, Trás-os-Montes e Alto Douro (775 images), Açores (603 images), Évora (447 images) and Beira Interior (285 images) stand out as the Facebook Pages with more images that are very likely or likely to express joy. But what are those images related to? What would be the motive for great happiness or pleasure? After plotting images separately (see appendices), it was possible to uncover the different motives that drives the visual imagery of UTAD, Açores, Évora and Beira Interior.

The happiness in UTAD is mainly featured by students, staff or professors posing for a picture in varied types of academic events, and the depiction of smiling speakers and audience. There is also *joy* in head shot pictures, news clipping, people drinking wine, in a few selfies, sports, tech related pics, and the inauguration of new facilities. In a similar spirit, the visuality of Beira Interior has a great focus on students participating in outdoor and indoor events. Although it also brings university staff and board members in these events, some selfies, head shot pictures and the register of awards ceremonies. The smiling audience, the act of posing for pictures in academic events and official ceremonies are also key visual characteristics in Évora, added by the overwhelming presence of students. Other types of events prompt the happy visuality of Açores: official ceremonies to award the best graduated students (both in an auditorium and in the rectory building); events where the faculty staff and board members get together, e.g. in the rectory building, outdoor picnic. Photos of students in classroom, in the rectory building or in outdoor events are also common.

Beyond the academic events that put together students, professors, staff and board members, there is a common reason that brings *joy* to the higher-educational environment; the visit of the president of Portugal, Marcelo Rebelo de Sousa. His presence is synonymous of a series of pictures in the Facebook timeline images of UTAD, Açores, Évora and Beira Interior universities. The International Exchange Erasmus Students Network connects also to the *joy* of Évora and Beira Interior, and although sporting achievement are too little, these images often connect to felicity.

When further analysing the other face expressions, the results supplied by computer vision can be deceptive. The Facebook timeline images that contain *surprise* (64 images) do not exactly depict faces showing that something unexpected may

have happened. Rather, we see face expressions that may be tricky for machine learning algorithms, e.g. to raise eyebrows or open and close the mouth when talking or giving a presentation. Although useless for detecting real surprised faces, the results provided by machine vision demonstrate a type of visuality that should perhaps be avoided in institutional communication; for not offering a pleasant visual identity (e.g. [a](#), [b](#), [c](#), [d](#), [e](#)).

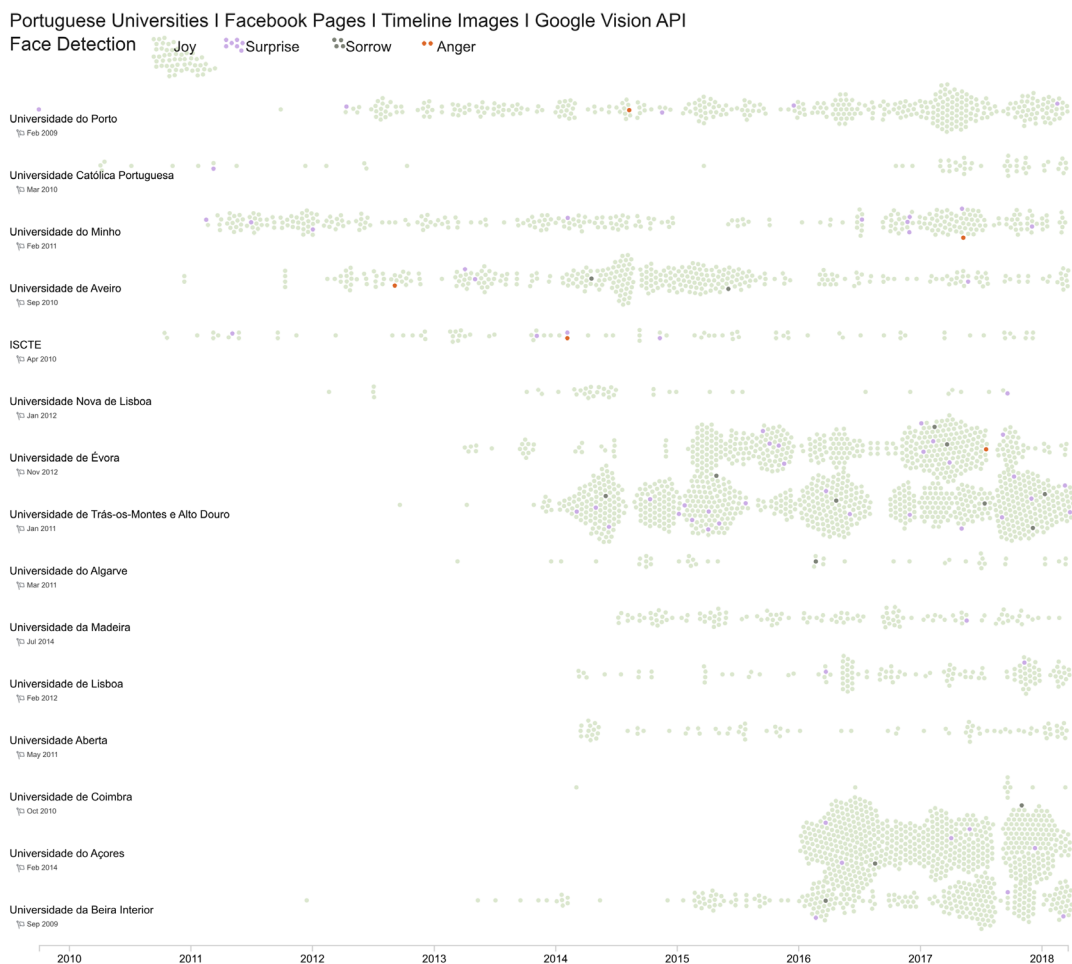


Figure 10: Computer vision for seeing the mood of Portuguese Universities over the years according to face detection module of Google Vision API. Four main expression were detected as very likely or likely to appear in the universities Facebook images timeline: joy, surprise, sorrow and anger.

The *sorrow* related images (a total of 14) are mainly groups of students in different situations such as: in learning environments when they appear to be very [concentrated](#) and sitting in a small auditorium or standing in a laboratory paying attention to the professor (e.g. in [Açores](#) and in [UTAD](#)); in academic events (e.g. [1](#) and [2](#) from UTAD, and e.g. [3](#) from Aveiro); or [students being interviewed](#) by a television reporter (Algarve). Institutional and academic events also categorise a few *sorrow* images, e.g. [university staff happen to appear in organising or planning activities](#) in an educational event (Beira Interior), [a picture zooming in focused audience sitting in an auditorium](#) (Açores), and when a university receives the president of Portugal, Marcelo Rebelo de Sousa who, accompanied by [the dean of Évora University \(Ana Costa Freitas\) and board members](#), was walking up stairs to enter the university building (Évora). There is also the case of detecting *sorrow* faces in banners; one promoting an exhibition about the miracles of Nossa Senhora de Fátima constituted by an old black and white photo with [three children staring at a camera and looking all sad](#) (UTAD), another with [Alfred Hitchcock looking down another filmmaker](#) (Évora).

The five images with *anger* faces derive from the practice of sports, except for the [promotion of the Masters in Theatre](#) of Évora University in 2017. The other cases bring winner athletes such as [João Paulo Fernandes who get the second place](#) in London Paralympic Games 2012 (Aveiro); [the celebration of Porto's female Rugby team for third place](#) in the European University Games 2014 (Porto); the image of [Minho's female five-a-side football athletes](#) in the middle of the court celebrating (probably the victory) in 2017 (Minho), or the [applications for EA Campus 2014](#) (ISCTE).

The thick description about face detection, in particular *surprise*, *sorrow* and *anger*, intentionally calls our attention to the lack of precision and limitations of computer vision APIs.

Discussion

The study of Portuguese Universities Facebook Pages exposes some practical and institutional implications for both research and communication practices. For

this latter, we should consider that the use of social media for institutional communication is indeed a very recent activity: Facebook is a teenager (15 years old) and the oldest Portuguese universities pages on this platform were created in 2009 (Porto and Beira Interior). For the last ten years, Portuguese universities have been learning how to communicate on Facebook, while they use it and rely on its affordances.

However, it also becomes clear that Portuguese universities are using Facebook as just another platform to “shout out” their activities. At the same time, most universities seem to be not spending enough time building their social media networks or giving attention to some aspects of their missions. Research activities or accomplishments, for instance, are very seldom referred, which means that science communication is practically inexistent. Connection with the outside world is also neglected.

When seeing the dominant images shared by Portuguese universities, we find mostly “Portugal Sentado” (people seated while listening to conferences) and conference posters, showing very little imagination and a somewhat careless attitude towards social media best practices and potentialities for communication. By using the same type of photos time and time again, universities are perpetuating the stigma of a boring academic environment. The “institutional” visuality of academia reproduced by Portuguese universities fails in getting advantage of the attention economy of Facebook. In other words: no “clickworthy” and “shareable” content.

From the research perspective, the innovative approach of vision API-based networks shed light on how the universities in Portugal make use of, manage and give priority to their visual content over the years. The digital visual methods adopted here come along with thick descriptions, technical knowledge and practical expertise; highlighting the need of questioning the methods of the medium critically. That is the case of recognising the lack of precision and limitations of computer vision in the analytical process or being aware of the problems with web data (knowing how to deal with it!).

Our proposal of *calling into the platform* is an invitation to conduct communication and social research through the lens of medium-specificity. Following Latour's oligoptic vision of society, it derives from the explorations in the context of the device-aware sociology (Marres 2017) and the technical-practical fieldwork. This reality challenges new media researchers to take advantage of the intrinsic properties and dynamic nature of digital platforms, and here lies the main contribution of the article. That is a practical walk-through the possibilities of repurposing the technicity of networks for studying societal (institutional) phenomenon on Facebook. A call for another culture of making research questions and designing research; a call for embracing an open-ended process in which new questions are always welcome.

Acknowledgement

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Notes

- [1] E.g. Page description, post date of publication, reactions, shares, comments, posts per hour (post_activity), how users interact with or talk about a page (talking_about_account), the total number of likes a page has received (fan_count) and whether users can or cannot post in a Page (users_can_post) <https://developers.facebook.com/docs/graph-api/reference/page/>
- [2] As socio-technical formations, digital networks offer ways of understanding social and cultural phenomena (including institutional communication).
- [3] On image-label networks see the work of Ricci, Colombo, Meunier, & Brillì, 2017; Omena et al. 2017; and Mintz et al., 2019.

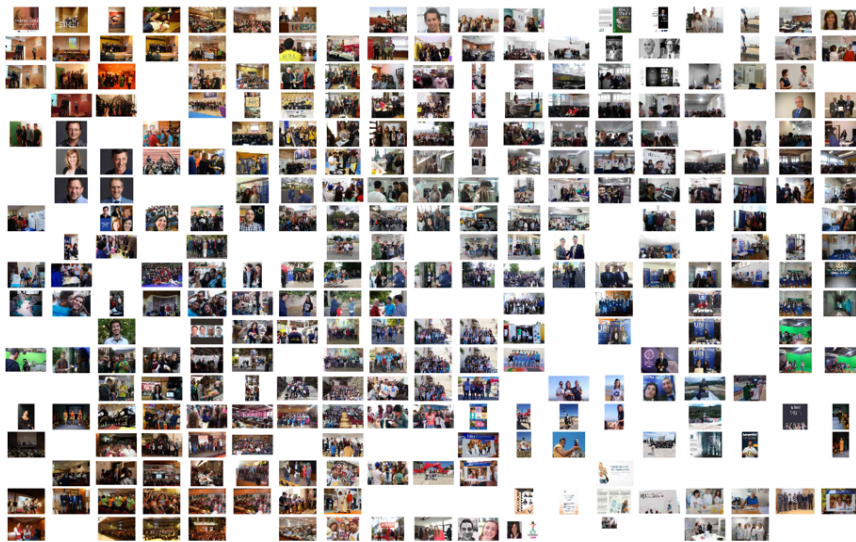
- [4] Netvizz is no longer available for research purposes, it stopped working on September 4th, 2019.
- [5] In March 2017, the University of Coimbra had 363 timeline images registered and in March 2018, we detected the page had changed its Facebook ID; from 170094986358297 to 159654804074269. The total of 66 images collected though corresponds to the latter page id and all images were uploaded between 21 June 2013 to 13 March 2017.
- [6] Research protocol diagrams presents the entire research process “in a compact visual form” (see work of Niederer and Colombo 2019); it visually informs the research steps advanced by digital methods approach.
- [7] <https://medialab.github.io/graph-recipes/#!/upload>
- [8] That corresponds to an expanded version of Memespector originally developed in PHP by Bernhard Rieder, and later ported to Python and expanded by André Mintz. Available in: <https://github.com/amintz/memespector-python>. See Google Vision API here <https://cloud.google.com/vision/>.
- [9] <https://github.com/amintz/image-network-plotter>
- [10] <https://visual-computing.com/project/imagesorter/>
- [11] In practice, this force-directed layout provides a narrative thread that has fixed layers of interpretation but multiple forms of reading (see Omena & Amaral, 2019).
- [12] When a node connects nodes of different clusters.
- [13] Facebook used to have six broad categories of pages: Local business or place; Company, Organization or Institution; Brand or product; Artist, Band or Public Figure, Entertainment; and, Cause or Community. Each category had a long sub-category list. In July 2019, we verified that the platform now only offers two broad categories of pages: i) Business or Brand and ii) Community or Public Figure. These latter are also constitute by sub-categories but, now, they can only be visible when searched, see <https://www.facebook.com/pages/creation/>.
- [14] For instance, Münster University, University of Groningen, Universidad Carlos III de Madrid, UNED - Universidad Nacional de Educación a Distancia, Universidade da Cidade de Macau, and Portuguese Higher Education: Universidade do Porto, Instituto Superior Técnico, Universidade da Beira Interior, Universidade Lusíada de Lisboa, Escola Superior de Comunicação Social, Universidade de Lisboa, Laboratório de Ciências da Comunicação, ISCTE Business School.
- [15] [Turismos Universidade de Coimbra](#), [Relações Internacionais Universidade de Coimbra](#) - [International Office](#), [Sociologia, Universidade de Coimbra](#), [Clube de Robótica da Universidade de Coimbra](#).
- [16] <https://www.facebook.com/UniversidadeCoimbraBrasil/>

Appendices

Portuguese Universities | Facebook Pages | Timeline Images | Google Vision API | Face Detection
JOY -- 755 Images | Universidade de Trás-os-Montes e Alto Douro | January 2011 to March 2018



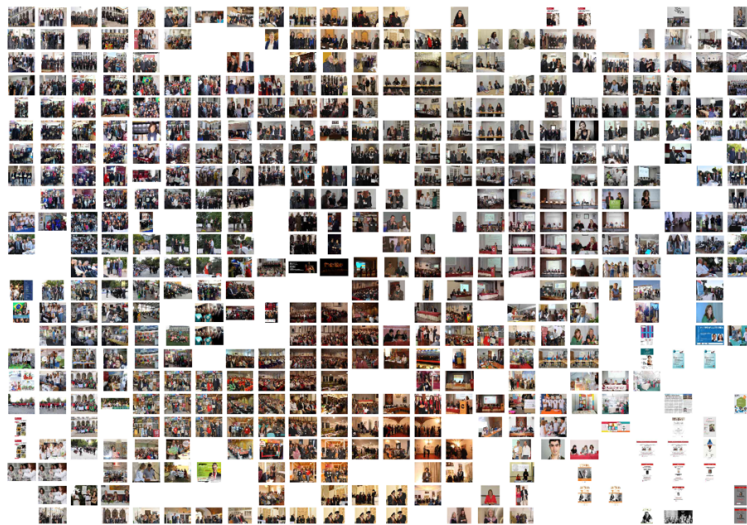
Portuguese Universities | Facebook Pages | Timeline Images | Google Vision API | Face Detection
JOY -- 285 images | Universidade da Beira Interior | September 2009 to March 2018



Portuguese Universities | Facebook Pages | Timeline Images | Google Vision API | Face Detection
JOY -- 603 images | Universidade dos Açores | September 2010 to March 2018



Portuguese Universities | Facebook Pages | Timeline Images | Google Vision API | Face Detection
JOY -- 447 Images | Universidade de Évora | November 2012 to March 2018



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