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# Personal Instants

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**We live in a society governed by information, much of which is produced by us through the most diverse ubiquitous computing devices. Every day more people are connected to the Internet and more information is produced. In large part, this increase in online production is due to social networks and the content we produce and share on them. *Instagram* alone has more than one billion users. As almost all activities on social networks, many of our activities on Instagram are performed in a few seconds and quickly become part of the past and are forever forgotten. In this paper, we present *Personal Instants*, a web-based tool to visualize the entire activity data of an *Instagram* user. By using the users own personal data to compose the visualization, the tool aims to portray the amount of data that we produce on the social network Instagram. Withal, we intend to profile our online social behavior through our usage patterns and types of actions performed, thus visually perpetuating our ephemeral online social activity. The work was subsequently evaluated with the creation of a form where the participants responded to both analytical and aesthetic aspects of our approach to visualization.**

## 1. Introduction

For some years now, we have been living in a recognized information society where the use, creation, distribution, manipulation and integration of information is a deep-rooted and almost unconscious activity of our daily lives (Manovich 2005). The Internet is a central pillar of this society, where the latter depends heavily on the former. The proof of this is the fact that until 2013, about 90% of the Internet content has been produced in the two previous years only (Max Roser and Ortiz-Ospina 2015). This phenomenon may be explained by the increasing number of mechanisms for capturing and registering the most diverse daily activities and the increasing size of the stored data. Also, it may be caused by the increasing number of Internet users. For instance, every hour, 27.000 users access the Internet for the first time (Max Roser and Ortiz-Ospina 2015) — the more users, the more the data. Nowadays, the number of Internet users surpasses 3,5 billion, almost half of the world population, and social network platforms are used by two-thirds of all Internet users, representing a considerable portion of our virtual activity (Max Roser and Ortiz-Ospina 2015). More than ever, we are constantly producing and storing data on the Internet and much of these contents are images, videos and other documents shared through social networking, which together form a virtual universe of digital organisms.

*Instagram*, launched about 10 years ago, is a social network that quickly stood out, currently being in the top 3 behind *Facebook* and *Youtube* with about one billion users (Max Roser and Ortiz-Ospina 2015). Like almost all social network activities, much of our activities on *Instagram* are considered and executed within a few seconds, which, at the distance of a button or a swipe gesture, is part of the past and becomes forever forgotten in an infinite scrollable virtual space (the feed). All of these actions shape our virtual persona, which in turn affects the environment for our personal benefit (the feed adapts to our interests and likes). At the same time, through our online attitude, a persona is drawn for us, bringing us closer or farther away from people that are similar or behaviorally distinct from us.

From this reflection comes *Personal Instants*, a visual representation of our spontaneous activity on the *Instagram* social network that aims to reveal the huge amount of data and content produced by us in this virtual universe and, at the same time, reveal our type of virtual persona, our online social stance, in a perpetual manner. The tool presents itself as a resource for users to explore all their activity in an overview mode so that they could discover unknown activity patterns and understand a little better the type of behavior they have

on the social network. In addition, the tool provides the possibility to generate a personal artifact using the users' data, representing their type of persona on the social network. The choice of perpetuating the user's activity in this type of profiling seeks to attain the purpose of self-portraits static on canvas, for future contemplations (Sampaio and Ribas 2019). The work resorts to the users' own downloadable data about their *Instagram* activity which is then used to define the visualization elements and their disposition.

## 2. Related Work

Nowadays, an increasing number of visualizations of personal data are being produced by new casual creators with the intent of exploring novel visual concepts and materializations to depict their data, either to transmit new sensations and tell a story in a more humane way and/or to produce artifacts of artistic nature. These recent practices originated a thriving sub-domain of Information Visualization: Casual Information Visualization. This sub-domain can be separated from traditional Information Visualization systems by following main factors: the target user population; the usage context of the developed works; the type of data used, generally more personally interesting and relevant to target users; the types of insights they intend to foster Pousman, Stasko, and Mateas (2007).

*LastHistory* (Baur et al. 2010) visualizes digital music consumption based on the user's personal data from a social network, the music-recommendation service *Last.fm*. *LastHistory* has been implemented for Mac OS only, making it impossible to use with other operating systems. The data is retrieved with *Last.fm* API, from where every listened song is represented by a circle (colored by genre and sized by relevance) in a simple timeline. The authors also add personal calendar events and photos to further trigger active memories.

*Embroidered Ephemera* (Sullivan 2020) explores the huddled data creation on the social network *Twitter*. The work deals with something that can take just a few seconds to create and share, and just as quickly disappear — the tweet. Nevertheless, the authors make perpetuate it in "embroidery", which conversely, takes a long time to create as well as to disappear. The work results in an online tool that allows users to enter a *Twitter* user or hashtag and then generate an embroidery sample design according to the tweets retrieved by the system.

Sampaio and Ribas's work addresses the new paradigm of personal data collection, where they are particularly interested in the application of pleasant visualizations to represent digital self-portraits. Their *Data Self-Portraits* (Sampaio and Ribas 2019) work series makes use of information about the environment, physical aspects of the users (heart rate and energy spent) and some of their everyday activities such as online searches or distance traveled away from home. The system consists of a web-based program to generate abstract visualizations, comprising static images and dynamic outputs that can be interactively explored through a polar coordinate system and a timeline approach. This work series establishes a close connection to the type of visualization that we aim to create since their main focus resides on user profiling. The authors deepen their research in a later article (Sampaio and Ribas 2020) where other works with similar objectives are reviewed. From these, we highlight *Poisonous Antidote* (Farid 2016), and *Spigot* (Oracle's Reflection) (Salavon 2009). *Poisonous Antidote* resulted in a website where everyone can consult the author's e-mails, messages, phone calls, browsing history, location coordinates, social network posts, as well as any photographs or videos on his phone. All of this data was sent to a 3D printer to create abstract sculptures, each one representing a day of the artist's "digital life". This work represents personal information in unlikely ways in order to achieve different purposes, which demonstrates the high range of possibilities for the representation and materialization of the same data.

*Spigot* is a real-time public investigation of Salavon's personal Internet search history. The work gathered over 12.000 searches that are visually translated into two modes. In one, the literal text and time of a search are displayed, giving a deeply personal voyeuristic view into the artist's private search habits. The second mode presents the same type of data as endless concentric, psychedelic data-streams, as a mostly aesthetic-driven composition translating his entire activity.

*Artificial Senses* (Albrecht, n.d.) visualizes sensor data retrieved from the ubiquitous devices that surround us to promote an understanding of how they experience the world. Through the machine perspective, this work gives us an even more raw view of our data patterns and their storage resulting "shapes".

*The Sixth Sense* from Clever Franke Barros et al. (2018) is another interesting application of real-time sensory data visualization, this time applied in a club. The authors collected activity data from the guests through hybrid bracelets that were provided to them. They captured data such as guests' movements and room temperature, which was then used to create personalized real-time

data visualizations that were being projected during the club event. At the end of the event, all guests received a unique and personalized artifact, a data visualization summarizing their own activity. This work manages to reveal, in real-time, albeit on a smaller scale, the amount of data that are possible to collect about our activity and, at the same time, how data-driven artistic artifacts can be generated, disclosing new aesthetic possibilities to be explored with data visualization.

Lupi and Posavec are quintessential examples of those who practice this new data exploration paradigm. They use data from personal experiences (our activities, thoughts, behaviors, relationships) and seeks to grasp our human nature and every aspect of our society through engaging visual narratives. Moreover, they often take into consideration visualization field literacy, hence exploring friendly approaches to communicate the data so that it could be appropriated to all ages and audiences. One seminal work in this subject is *Dear Data* (Lupi and Posavec 2016), which returns to the initial practices of data collection by producing entirely hand-drawn data visualization shared between the two of them, exploring the overlooked aspects of our everyday routines through data. Lupi further developed other works on the same topic such as Data Portraits at *TED* (Lupi 2017) and *What Counts* (Lupi 2019) of which she also generates physical artifacts, as a result of user inputs and interactions with the works.

After reviewing the previous works, an important aspect to take into account when implementing our work was its accessibility to the users. Developing work for the web environment, such as the works of Sullivan or Sampaio and Ribas, is an asset since it allows more comfortable dissemination of the work and its easier access for many more users since generally it does not require anything else but the browser to be experienced. *LastHistory* fails in this regard as it was developed as a desktop application and only for Mac OS, limiting its use only to users who have access to such an operating system. The question of personal data disclosure is increasingly relevant and, as such, more attractive for ordinary users to perceive and visualize this same data about themselves. Casual Visualization operates here as a valid way to reveal the size and composition of that data itself so that the user can have greater transparency of what he is providing to third parties. *Spigot* and *Poisonous Antidote* are examples of works that use the personal data of their authors and make them public, accessible to the public audience, even if in more artistic and abstract ways. These two works present another aspect that we intend to explore in our work. Both use personal data to make a more artistic exploration, with a high aesthetic component consideration. Furthermore, *Sixth Sense* is another example of work that

shows how these types of personal data, more or less intimate, which are often collected and produced effortless, present themselves as possible sources to generate visual artifacts for the most diverse ends, namely of artistic nature. In our case, we wanted to produce static pieces that can work as a unique souvenir/artifact for each user.

### 3. The Tool

*Personal Instants* is a web-based tool that displays a visual mesh made up of the entire activity data of an Instagram user. Each one of its modules represents a single action/event. This activity is obtained through the data that Instagram allows its users to download. The data downloaded divides the user activity into a set of *JSON* files from which we choose to use the following files:

**1.** Connections: When the user started following other *Instagram* users. When other Instagram users started following the user and *Instagram* users defined as close friends by the user.

**2.** Media: All photos, stories and videos uploaded by the user and direct content sent to other Instagram users.

**3.** Seen Content: All photos, videos, ads and chain content seen by the user.

**4.** Likes: Likes the user gave to other users' contents such as posts and comments.

**5.** Comments: Comments made to friends' posts or replies to other comments.

**6.** Saved: All content that the user archived.

The tool was designed for the web, using JavaScript and using the *P5.js* library, so it is accessible and easy to use for anyone who wishes to consult their own *Personal Instants* artifact. Among the downloaded files, there are other more intimate files, such as direct messages, which for that same reason were not used as they also were not relevant to the purpose of our work. The objective of our work is to reveal the immensity of media content produced, shared and stored by us in social environments, namely, on *Instagram*. Furthermore, it intends to communicate information about the users' social posture online, that is, to reveal what kind of user they are, with a more aesthetically driven approach. As such, there has been a central consideration not only in the data structure

but more importantly, in its visual materialization, to create an aesthetic artifact, that could behave and stand as a self-portrait alone. An approach in this sense is made by translating all the user data into an abstract visualization representing the user's virtual persona.

### 3.1. Visualization Organisms

Taking the metaphor of the universe of virtual organisms aforementioned, we wanted to represent each type of action/event through a distinct organism. Generally, when we talk about organisms from invisible universes, we are often talking about microscopic organisms, as if they were the unitary modules of something bigger. For that reason, we chose a pixel-based approach to create the organisms, since the pixel is the module of the virtual universe when made visible (Graf 1999).

The type of action/event of the organism is indicated by its main color. The remaining parts of the organism were designed to visibly resemble the icons that are generally used to represent the respective object or action. Active actions/events such as media production and sharing, giving likes and making comments take on more vivid colors in order to stand out more while passive activity. This does not involve the creation of new data, such as visualizing other users' content or making new connections to acquire less vivid colors (see Figure 1).

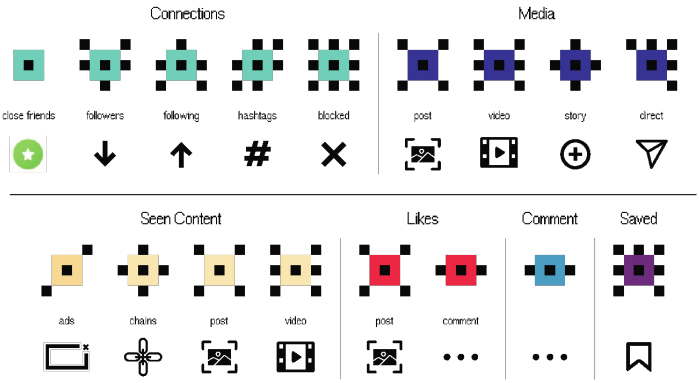


**Fig. 1.** Type of action/events and corresponding organisms.

### 3.2. Grid Visualization

As said before, our activity data is distributed across multiple files, where each event is labeled with a time of occurrence (timestamp). However, since our activity is recorded in a linear manner throughout our *Instagram* usage, one prior processing of the data was done so that the information was grouped into a single structure containing the user's activity temporally ordered and separated by days. After obtaining the now ordered structure of the entire data, the visual mapping process also took into account this linear process of registration, and as such it was designed through a continuous thread (just like the feed is presented on *Instagram*). Here it is constructed from left to right and from top to bottom, generating a visual mesh to be read in a familiar and natural process for the users. The horizontal dimension of the mesh will always take the entire horizontal dimension of the screen where it is being displayed, always creating a mesh as compact as possible and avoiding the creation of empty spaces.

To more easily locate the represented organisms in time and also to have a better perception of the user's daily activity dimension, a tag containing the corresponding date was added to the beginning of each day's activity. Another temporal variable that was taken into account was the user inactivity interval, that is, the gap of days without any type of activity associated with the user account. To represent this interval, and to emphasize this personal behavior which in our opinion is distinctive information in the user profile characterization, a visual interval was added to the mesh with the number of modules equal to the gap of inactivity days (see Figure 2).

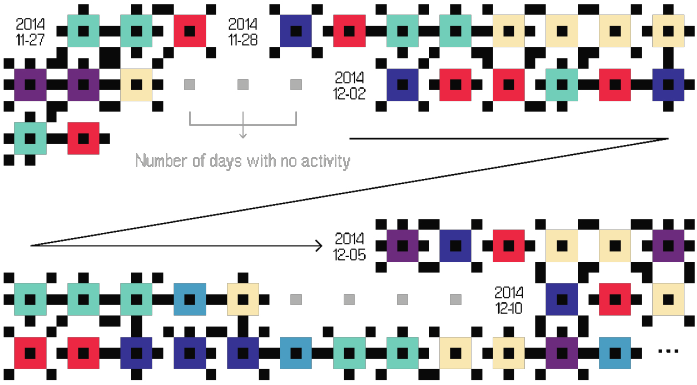


**Fig. 2.** Activity mesh mapping process, starting on the canvas top-left corner and taking a direction from left to right and from top to bottom.

Since very long outputs can be generated, the user was allowed to interact with the visualization, being able to define the time interval he/she wants to view or highlight the types of activities he/she wants to consult. To see a specific activity, the user can click on the corresponding organism to access all its information.

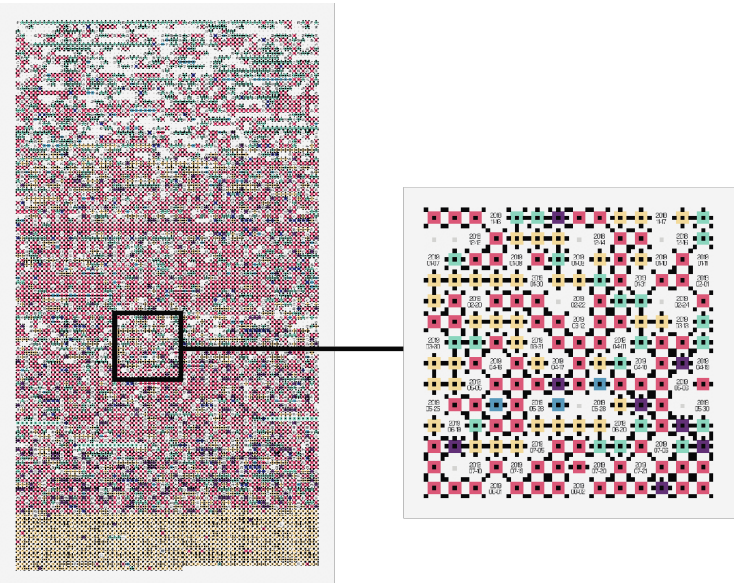

**Fig. 3.** Grid visualization of one user data. On the right, can be seen a zoomed excerpt of the visualization

### 3.3. Virtual Persona

In addition to the grid visualization, where all actions that constitute the user's activity are broken down to a single organism, we also intended to represent that same activity in a more abstract and condensed way that could allow the profiling of the user's online behavior, as a self-portrait of the user activity. To be able to represent any size of data, a mapping process of the element's dimensions and positions had to be carried out. The data mapping process was based primarily on a polar coordinate system (see Figure 4).

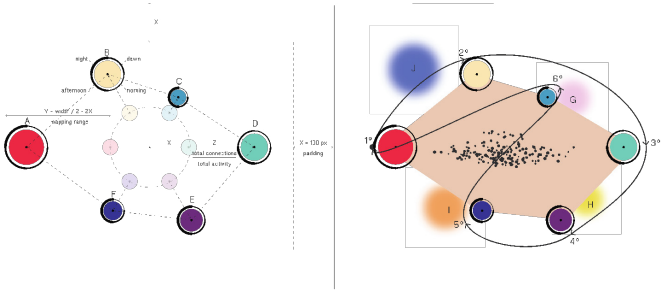


**Fig. 4.** Virtual Persona mapping process.

The six main types of activity (*comments, connections, likes, media, saved, seen content*) are represented in six points equally distanced, along a circumference, from the center of the canvas. Each type of activity is represented by a circle filled with the corresponding color, activity centroid (AC), marked from A to F in figure 4, left. The diameter of the circle is a mapped value representing the ratio of the total events of that type of activity divided by the entire user activity. At the same time, the bigger the diameter, the further away from the center the AC will be. From this choice of design, the user can quickly and easily perceive a relationship between the amount of each type of activity.

Another visual element associated with each type of activity is the division of that same activity into four parts of the day: *dawn, morning, afternoon and night*. These parts of the day are divided between 0h – 6h, 6h – 12h, 12h – 18h, 18h – 24h, respectively. Each part is represented by a 90° arc around the activity circle. Starting from the top, the arcs are drawn clockwise. The stroke weight represents the relative amount of corresponding activity that occurred within that time period (see Figure 4, left).

In order to provide also a global idea of the entire activity distribution throughout the day, the activity is distributed over the same four parts of the day and mapped into four circles, marked from G to J in figure 4, right, where the diameter and distance to the center are calculated with the same formula applied to the circles that represent the different types of activity. To further distinguish types of personas among the users' data, we use the AC points, in decreasing order of events, to draw a polygon through vertex curves. This gives origin to similar forms for similar types of behavior. In a very similar way, another polygon was created using the same AC points. This polygon is colored with an average color, obtained with the average calculation of the RGB channels of the activity colors over the entire activity, thus obtaining a chromatic approximation to the user's predominant type of activity/activities.

The set of black circles within the area formed by the AC points represent the user activity days, each day is represented by a single circle. The circle diameter corresponds to the activities carried out on that given day. The circle position is, once more, obtained with an average calculation, using the AC points of the types of activities performed within that day. Figure 5 shows an example of a day were performed 10 events — 6 connections and 4 likes. The position of the circle corresponding to that day is obtained using the points associated with these types of activity.

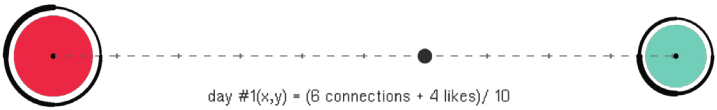


**Fig. 5.** The mapping process for each black circle that represents a day's activity.

Below, in figure 6, are presented the virtual personas resulting from the data of six users, three males and three females. They quickly reveal three distinct types of personas due to the predominant color of the polygon, further emphasized with the AC circles position and dimension. Personas #2 and #5 are *hard likers* given that the vast majority of their activity falls into the likes AC. Persona #4 is a *content collector* since it has a lot of saved content while personas #1, #3 and #6 present a more distributed activity. This evidence is quickly provided by. We can also infer that users tend to be more active during the night, between 16h and midnight. The virtual personas presented here are the result of users' entire activity. The online tool also allows seeing the evolution of this representation over the days, helping to understand the changes in the user's behavior throughout time.[1]

**1.** The 6 virtual personas and their time lapse animations can be consulted at: https://2021.xcoax.org/files/070-Personas

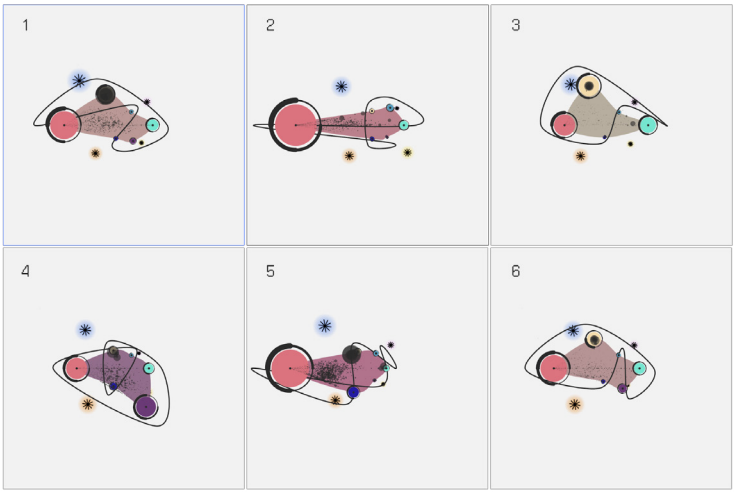


**Fig. 6.** Virtual Personas resulting from six different Instagram users' data.

## 4. Tool Evaluation

Since the work was conceived with the intent of perceiving the different types of *Instagram* users' profiles, namely through their behaviors, we requested the activity data from ten users, of which the results of three are presented in figure 7[2]. As the visual approach was designed with a strong aesthetic consideration, we also wanted to see if the compositions obtained could elicit different types of insights than when looking at the same data in more traditional and analytical ways.

2. The 3 user activities can be consulted in further detail (PDF format) at: https://2021.xcoax.org/files/070-Activities

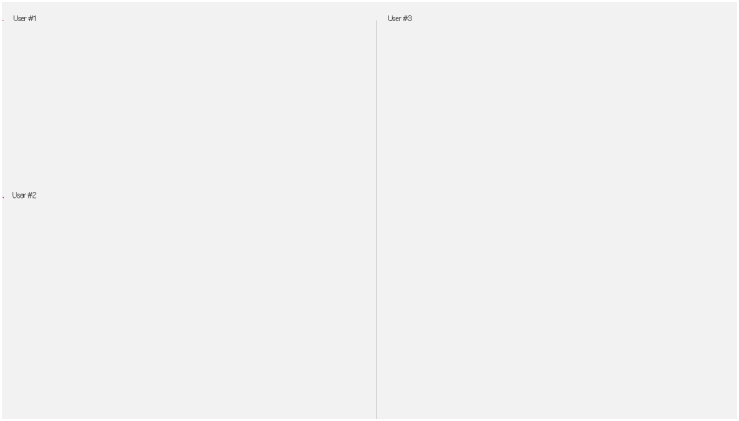


**Fig. 7.** Activity data from three Instagram users portrayed by *Personal Instants* Tool.

### 4.1. Methodology

We composed an online form and made it available to a computer science research lab at our university., An initial introduction section covered the context and objective of the developed work. This background was followed by an instruction phase, in which participants were introduced to each of the visualization elements (with figure 1) and the visual mapping approach briefly explained (with figure 2).

To begin, participants were asked to rank their knowledge on Data Visualization using a 5-point Likert scale (1 = None, 5 = Expert), so we could access whether or not such background could influence the interpretation of the work. Then, the three users' activities were provided in PDF format to be consulted in more detail.

We asked to the participants to provide the insights/differences they could retrieve about the activity of the three users with our visual representation (see Figure 4). Finally, participants were asked how they consider the composition approach in aesthetic terms, using a 5-point Likert scale (1 = Not aesthetically pleasant, 5 = Very aesthetically pleasing).

### 4.2. Results

Fourteen participants answered the form, five females and nine males. Nine participants listed their experience with Data Visualization as high (4 or 5), four as moderated (2 or 3) and the remaining participant as low (1). Next, the insights provided by the participants to the user profiling and the visual approach are presented. The number of times a given insight has been provided is shown within parentheses.

**User Profiling**

Regarding the profiling of user behavior, the participants provided the following statements about each one of the users:

**User #1**

» The user who uses *Instagram* less the *Instagram* because the pattern is less filled (inactivity gaps).
» The usage evolution of the app is visible, using more now (x2).
» Observer user, sometimes leaves some likes, sometimes makes posts.
In summary, makes a little of everything. More balanced behavior as it seems to go through all activities (x4).
» Passive-active user (x2).
» Gives many likes/comments.
» Makes connections and sees contents.
» "Normal" user (x2).
» Has defined close friends.

**User #2**

» Seems to focus more on one type of activity (like and comment).
» The usage evolution of the app is visible, using more now (x2).
» Saves much more posts (x6).
»VHard poster and liker. (mistaken the media and saved colors).
» Very active-active user.
» Gives fewer likes (than remaining users) (x2).
» Performs a little bit of all types of activities.
» Seen less content (than remaining users) (x2).
» Seems a collector of content (x3).
» Has defined close friends.

**User #3**

» Seems to focus more on one type of activity (like and comment) (x7).
» Focuses its activity on giving likes, watching stories and sending directs (x2).
» Very active-active user (x6).
» A great number of connections in the beginning.
» The user that posts more (x4).
» Has not defined close friends.

**About all users**

» The users do the same activity in a row several times (modules of the same color/ shape).
» The three users established connections, although User #3 did it mostly at the beginning of his activity. The others more throughout their activity.
» All users see more content at the end of their activity (x4).

**Visual Approach**

Regarding the tool's visual approach, twelve of the fourteen participants rated it with a major high appreciation (4 or 5) and the remaining two participants gave it a satisfactory appreciation (3). Regarding the idea itself, two participants considered it very interesting, stating also that it could be further explored with the integration of animation to represent the activity evolution or apply different visual aggregations in scenarios, for example, where there are several action/ events of the same type in a row.

Another participant said that "the white spaces in the composition aid in the distinction between activities" and that an interesting characteristic of the visualization mapping approach is that "it works both in close up and in general overview analysis". Even so, the participant pointed out that the analysis of User #3 activity was particularly difficult, as "it is vertically longer than the other two representations of activity". Despite being a valid observation, it would be easily answered if the user's activities were viewed through the tool itself, where the visualization would occupy the entire screen, but in order to provide access to several examples of activity under the same conditions for all participants, we decided to provide identical static versions instead.

Four participants found the different types of activity to be easily comparable mainly through color, but more difficult to distinguish the subcategories. This difficulty is due to the modules connected layout originating a visual aggregation of its external elements, thus making it more difficult to associate the elements belonging to the respective module. In addition, given the multiple subcategories, at least in a more initial phase, some participants mentioned the need to consult the explanatory image.

Although no information is given to the participants about our intent to make our work available under the format of a free, web-based tool so that any user could generate their pattern, several participants suggested precisely the evolution of the work in this way. Furthermore, they referred to the possibility of existing business investment on demand, where users could acquire their representation in different physical formats (posters, clothing, tile murals, etc).

## 5. Discussion and Future Work

The difference in the amount of activity between the three users was evident to the participants, having quickly noticed the different sizes of the three users. The participants were able to easily distinguish the different types of categories, mainly through the color, from where they were able to classify the three profiles as being three different types of users. However, there are some problems with the colorization of the modules to be improved, evidenced by the misinterpretation of a participant who read the saved content (purple) as media content (blue). Moreover, the visual mapping approach also needs to be improved taking into account that some users reported difficulty in reading the sub-categories when displaying the modules so close together. Still concerning the user behavior analysis, two participants noticed an increase in the frequency of use of the application for the first 2 users. At the beginning of the account creation, they presented many inactivity gaps of several days, reaching in some cases 2 weeks without activity and afterward took a more frequent, almost daily activity. These comments show that the intent of our inactivity gap visual variable was successful and was in fact able to reveal distinctive behaviors in the activity between users.

In general classification of the user profile, our visual approach proved to be able to categorize the three users as different types of users, where many participants considered the first user as passive, “normal” user, covering the different types of action/events in a moderated way, the second user as being more active and a collector, saving a lot of content, and the third user as the most active, producing a lot of content. In a more local analysis, participants also evidenced typical behaviors across all users as well as behaviors that distinguish them. A punctual action for User #1 and User #2 that generated a prominent pattern in their activity mesh was the definition of close friends. User #3 did not perform this activity. Performing the same activity on a row, especially giving likes and comments, is another very common pattern pointed out by the participants. One last comment that raised many questions to several participants was the high amount of activity in the Seen Content category (yellow category) at the

end of the activity mesh of all users. It seems that this type of information has only recently started to be collected (It is worth mentioning that this same information has recently become possible to consult in the application itself).

Taking into account the different levels of knowledge and the feedback provided by the participants, the visualization approach seems to have managed to communicate several insights without the requirement of prior advanced or moderate knowledge in the field of data visualization, revealing its accessibility to the general public. The qualitative appraisals of the visual approach were well-received, exposing a strong possibility of artistic exploration such as the materialization of the outputs in exhibitions or physical artifacts to provide to users. After all, taking into account the participants' feedback we can say that, although there are clear visual refinements and more explorations to be made, our tool has promising capabilities to perform user profiling analysis and, at the same time, generate visual artifacts with a good aesthetic appraisal.

In future work, we intend to improve the tool by adding more interaction functionalities. We plan to address the visual issues/suggestions to improve our tool. We will continue to experiment with distinct forms to represent the different organisms and explore more dynamic ways of mapping them in the canvas to achieve more diversified results structure-wise. In a more conceptual and artistic way, we also intend to explore the application of sound, namely in the creation of musical compositions obtained through the mesh of generated organisms.

## 6. Conclusion

In this paper, we presented *Personal Instants*, a web-based tool for visualizing Instagram users' activity data. The tool was developed in order to expose the dimension of the content produced by us and reveal information about what kind of user we are.

In our visualization approach, the data takes the form of a mesh that fits the screen where it is being displayed. The mesh consists of a set of modules that represent each type of action/event performed by the user. More specifically, the design of a glyph takes a pixel-based form, where the color and structure composition are the main attributes to distinguish the types of actions/events. In what concerns the layout, we choose a matrix placement, with a linear, familiar reading to the users, depicting the temporal dimension from left to right and from top to bottom. We applied the proposed method on the dataset from

multiple *Instagram* users to assess the tool capability to distinguish different types of user behavior.

To further validate the quality of the visual and mapping approaches in both analytical and aesthetics terms we analyzed the testimonials obtained through the form made available. In that form, the participants provided information about the types of insights they were able to derive from our tool outputs as well as their opinion regarding the aesthetics of the visual approach. With this information we could retrieve valuable suggestions to improve our work in the future, both at the organisms' level (such as their color and exterior structure) as well as the level of disposition and animation of the entire structure as a whole.

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## References


**Albrecht, Kim.**
n.d. “Artificial Senses by Kim Albrecht.” https://artificial-senses.kimalbrecht.com/.

**Barros, Sergio, Jack Jansen, Pablo Cesar, Thomas Röggla, and David A Shamma.**
2018.“Designing the Club of the Future with Data: A Case Study on Collaboration of Creative Industries.” In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems*, 1–9.

**Baur, Dominikus, Frederik Seiffert, Michael Sedlmair, and Sebastian Boring.**
2010. “The Streams of Our Lives: Visualizing Listening Histories in Context.” *IEEE Transactions on Visualization and Computer Graphics* 16 (6): 1119–28.

**Catarina Sampaio, Luísa Ribas, Pedro Ângelo.**
2019. “Data (Self) Portraits: An Approach to the Visualization of Personal Data from an Autoethnographic Perspective.” In *XCoAx 2019: Proceedings of the Seventh Conference on Computation, Communication, Aesthetics & X*.

**Farid, Mark.**
2016. “No Title.” *Poisonous Antidote*. http://www.poisonous-antidote.com/.

**Graf, Rudolf F.**
1999. *Modern Dictionary of Electronics*. Oxford: Newnes.

**Lupi, Giorgia**.
2017. “Data Portraits at TED.” http://giorgialupi.com/data-portraits-at-ted2017/.

**Lupi, Giorgia.**
2019. “What Counts.” http://giorgialupi.com/whatcounts.

**Lupi, Giorgia, and Stefanie Posavec.**
2016. *Dear Data*. Chronicle books.

**Manovich, Lev.**
2005. “The Shape of Information.” *Retrieved March* 5: 2012.

**Max Roser, Hannah Ritchie, and Esteban Ortiz-Ospina.**
2015. “Internet.” *Our World in Data*.

**Pousman, Zachary, John T. Stasko, and Michael Mateas.** 2007. “Casual Information Visualization: Depictions of Data in Everyday Life.” *IEEE Transactions on Visualization and Computer Graphics* 13 (6): 1145–52. https://doi.org/10.1109/TVCG.2007.70541.

**Salavon, Jason.**
2009. “No Title.” http://salavon.com/work/SpigotOraclesReflection/.

**Sampaio, Catarina, and Luísa Ribas.**
2020. “On Data Portraits: An Analysis of Creative Approaches to the Visualisation of Personal Data.” *Proceedings of EVA London* 2020 30, 255–62.

**Sullivan, Anne.**
2020. “Embroidered Ephemera: Crafting Qualitative Data Physicalization Designs from Twitter Data.” In J*oint Proceedings of the ICCC 2020 Workshops (WS 2020)*, edited by Max Kreminski, Viktor Eisenstadt, Sofia Pinto, and Oliver Kutz.