CV3: Visual Exploration, Assessment, and Comparison of CVs

Velitchko Filipov[1], Paolo Federico[1], Silvia Miksch[1]

[1] TU Wien, Austria

Abstract

Curriculum Vitae (CV) is an established representation of a person's academic and professional history. A typical CV is comprised of multiple sections associated with spatial, temporal, nominal, and ordinal data. Commonly, comparing and assessing CVs is done by viewing them in a side-by-side fashion. This becomes challenging when comparing more than two CVs, because the reader is required to switch attention back and forth, the overview becomes cluttered, and assessing the CVs becomes a nontrivial task. In order to address this challenge, we propose the design and implementation of an interactive exploration environment capable of comparing multiple CVs, visualizing their information in a clear manner, whilst maintaining a clean overview. Our approach offers users a new way to explore, assess, and compare multiple CVs.

CCS Concepts

•*Human-centered computing → Information visualization;*

1. Introduction

The search for employment in the last decade has become more electronic due to the increasing amount of people having internet access. As a result of this, a magnitude of Electronic Curriculum Vitae (E-CV) builders have been developed and provide users with options to showcase their personal information, skill sets, and work/education histories in a clean and visually pleasing manner. Such services are offered by e.g., Represent.IO [Rep], VisualCV [Vis], EnhanCV [Enh], and DoYouBuzz [DoY] to name a few. The new E-CV trend has also led to more employers accepting CVs online via e-mail or other mediums as opposed to the standard EuroPass CV [Eur].

The main task, that recruiters have, is to evaluate applicants for open positions. The most common and intuitive way to do so is to compare the CVs side-by-side and go through each of the sections individually. It becomes increasingly challenging when they need to concurrently compare multiple CVs, which is usually the case. The limitations of a side-by-side view become obvious - the reader is required to switch attention back and forth between multiple views, the amount of information increases substantially, and the overview is quickly lost. Switching between CVs and attempting to compare the different sections is a highly inefficient process. Furthermore, this technique does not scale very well with the amount of CVs that need to be compared and a new approach is needed. To solve this problem we have designed and developed an interactive environment supporting users in their tasks of exploring, comparing, and assessing multiple CVs using Information Visualization (IV) techniques.

Our contributions are (1) identifying limitations of the existing tools in the recruitment process, (2) the conceptual design and implementation of an interactive exploration environment assisting recruiters in comparing and assessing multiple CVs.

2. Related Work

Our primary focus is dedicated to the visualization and comparison of spatio-temporal data. Such data are present in the professional and academic history of a CV. We refer to the entries in these sections as events. Events contain time-oriented multivariate features and have a complex structure [AMST11]. The events' attributes have a temporal dimension (start and end date), a spatial dimension (location), and other possible metadata, including a categorization and other descriptors, including title, summary, media, etc.

A number of approaches on visualizing temporal data are available from Brehmer et al. [BLB*17], Plaisant et al. [PMR*96], including a survey of time-oriented data visualization by Aigner et al. [AMST11]. Similarly, for the spatial data a comprehensive overview of geovisualization techniques is available from Dykes et al. [DMK05].

On the one hand some related works explore spatio-temporal data visualization in an integrated view (isosurface approaches [Lor95]), such as Kapler et al. [KW04] and von Landesberger et al. [vLBA*12]. On the other hand spatio-temporal data can also be represented in linked views (multiple coordinated views [Rob07]), such as Cho et al. [CDW*16] and Jänicke et al. [JFS16]. A systematic overview of approaches, techniques, and methods for exploring and visualizing spatial and temporal data is available by Adrienko et al. [AA05].

The aforementioned techniques for visualizing spatio-temporal

data can be partially applied to CVs, in particular the professional and academic histories. By adapting and improving certain aspects of the approaches we can provide better support for visualizing and allowing an interactive comparison of multiple CVs.

3. Conceptual Design

We employ the nested model approach by Munzner et al. [Mun09] as our main design and validation methodology. At the first level we characterize the problem domain by utilizing the design triangle framework proposed by Miksch et al. [MA14], which considers three main aspects to ease the design process, namely the characteristics of the data, the users and their domain of expertise, and the users' tasks.

Data: Resumes, including personal information, employment history, education and training, professional qualifications, and social skills.

Users: Users are recruiters and hiring managers

Tasks: The overall and most important task that the users have is comparing and assessing the different sections of multiple CVs to identify potential hires.

The compare view contains three different components: cards, timeline, and a map. We use consistent color-coding throughout this view to allow candidates to be easily and intuitively distinguished from each other. Each component displays a different aspect of a CV. Furthermore, the components are linked together to allow for a seamless transition and more fluid user experience.
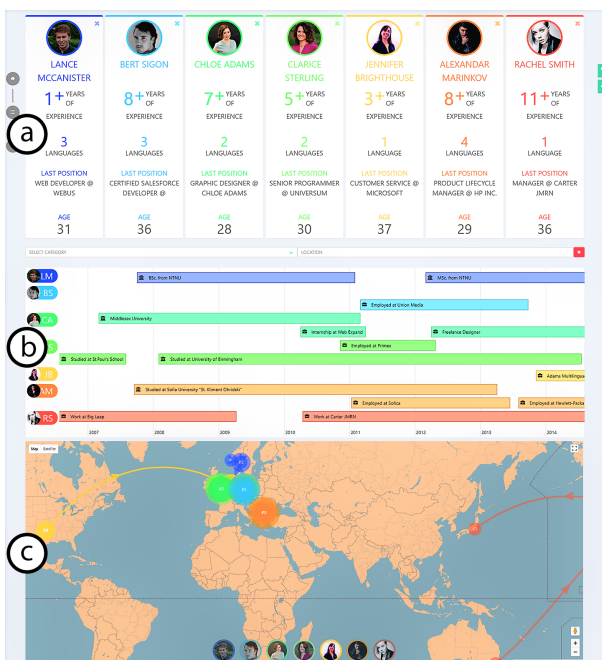

Figure 1: *Compare view of prototype available at* http://cvthree.cvast.tuwien.ac.at/ *a) overview of each candidates' general information, b) common timeline visualization, c) spatial visualization of events.*

Cards

The cards display general information about each candidate, including their name, age, years of experience working, number of languages known, and the last position they have held in a company. The data in this view is purely textual and should provide a clear overview of the candidate's information without the overuse of IV techniques. This approach builds upon the side-by-side viewing technique, as this type of visualization is convenient and familiar for recruiters. Users can interactively remove candidates from the compare view by clicking the close icon (×) in the top right corner of each card or add new candidates by clicking the plus sign (+) on the right side of the application. Details, such as the name of the language and proficiency are provided on mouseover effects.

Timeline

The timeline maps all events of the selected candidates to a common timeline representation and visually encodes the category of each event by using symbols. Each candidate's timeline is color-coded and on the left we display their profile picture along with the initials of the their name. On mouseover we display the details associated with each event, including location and start/end date but also the categorization and descriptors e.g., title, summary, and optional media. We have also extended the timeline to allow users to quickly filter events. This enables to conveniently compare a subset of the events with similar characteristics rather than the whole collection of events.

Map

The map view offers a visualization of the events' spatial information. We visualize each event as a marker, which is color-coded accordingly, and plot them on the map. The events of a single candidate are connected by lines, with an arrow depicting the direction of movement throughout both space and time. The markers react to mouse click events and display details associated with the event upon interaction. We also display a legend in lower part of the map, showing the selected candidate's chronology that is currently highlighted. Clicking on any of the candidates in the legend would highlight their path, while displaying other candidates at reduced opacity.

4. Conclusion and Future Work

In this paper we have discussed techniques for visualizing spatio-temporal data and how they can be applied to CV visualization. We have also presented our design of a prototype that offers possible visualizations for CVs and allows for an interactive experience to explore, compare, and assess a set of CVs. As for future work, there are numerous improvements that can be done including, adding a scoring system to rank CVs based on a user-defined metric, network visualization, and automatic assessment.

References

[AA05] ANDRIENKO N., ANDRIENKO G.: *Exploratory Analysis of Spatial and Temporal Data: A Systematic Approach*. Springer-Verlag New York, Inc., Secaucus, NJ, USA, 2005. 1

[AMST11] AIGNER W., MIKSCH S., SCHUMANN H., TOMINSKI C.: *Visualization of Time-Oriented Data*, 1st ed. Springer Publishing Company, Incorporated, 2011. 1

[BLB*17] BREHMER M., LEE B., BACH B., RICHE N. H., MUNZNER T.: Timelines revisited: A design space and considerations for expressive storytelling. *IEEE Transactions on Visualization and Computer Graphics 23*, 9 (Sept 2017), 2151–2164. 1

[CDW*16] CHO I., DOU W., WANG D. X., SAUDA E., RIBARSKY W.: Vairoma: A visual analytics system for making sense of places, times, and events in roman history. *IEEE Transactions on Visualization and Computer Graphics 22*, 1 (Jan 2016), 210–219. 1

[DMK05] DYKES J., MACEACHREN A., KRAAK M.-J.: *Exploring Geovisualization*. International Cartographic Association. 01 2005. 1

[DoY] DOYOUBUZZ: Doyoubuzz. http://www.doyoubuzz.com/us/. [Online; accessed 8-November-2017]. 1

[Enh] ENHANCV: Enhancv. https://enhancv.com/. [Online; accessed 8-November-2017]. 1

[Eur] EUROPASS: Europass. http://europass.cedefop.europa.eu/. [Online; accessed 8-November-2017]. 1

[JFS16] JÄNICKE S., FOCHT J., SCHEUERMANN G.: Interactive visual profiling of musicians. *IEEE Transactions on Visualization and Computer Graphics 22*, 1 (Jan 2016), 200–209. 1

[KW04] KAPLER T., WRIGHT W.: Geotime information visualization. In *IEEE Symposium on Information Visualization* (Oct 2004), pp. 25–32. 1

[Lor95] LORIG T. S.: Spatio-temporal display of event-related potential data in three dimensions. *Brain Topography 8*, 1 (Sep 1995), 3–6. 1

[MA14] MIKSCH S., AIGNER W.: Special section on visual analytics: A matter of time: Applying a data-users-tasks design triangle to visual analytics of time-oriented data. *Comput. Graph. 38* (Feb. 2014), 286–290. 2

[Mun09] MUNZNER T.: A nested model for visualization design and validation. *IEEE Transactions on Visualization and Computer Graphics 15*, 6 (Nov 2009), 921–928. 2

[PMR*96] PLAISANT C., MILASH B., ROSE A., WIDOFF S., SHNEIDERMAN B.: Lifelines: Visualizing personal histories. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (New York, NY, USA, 1996), CHI '96, ACM, pp. 221–227. 1

[Rep] REPRESENT: Represent. https://represent.io/. [Online; accessed 8-November-2017]. 1

[Rob07] ROBERTS J. C.: State of the art: Coordinated multiple views in exploratory visualization. In *Fifth International Conference on Coordinated and Multiple Views in Exploratory Visualization (CMV 2007)* (July 2007), pp. 61–71. 1

[Vis] VISUALCV: Visualcv. https://www.visualcv.com/. [Online; accessed 8-November-2017]. 1

[vLBA*12] VON LANDESBERGER T., BREMM S., ANDRIENKO N., ANDRIENKO G., TEKUŠOVÁ M.: Visual analytics methods for categoric spatio-temporal data. In *2012 IEEE Conference on Visual Analytics Science and Technology (VAST)* (Oct 2012), pp. 183–192. 1