



# The Power of Big Data of the Past – Let's Build a Time Machine!

## Panel session

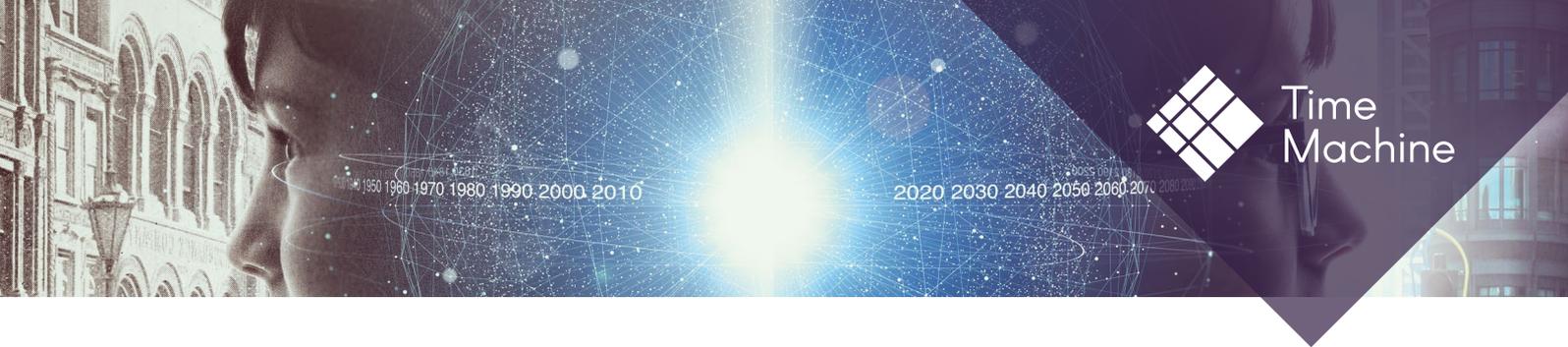
What would the world look like if we could access documents from the past as easily as present day's data? How would it be, if we could link all the data of our ancestors contained in any old record automatically with artificial intelligence?

A consortium of more than 500 institutions from science, technology and cultural heritage is currently aiming at nothing less than building a Time Machine. To succeed, a series of fundamental breakthroughs are targeted in Artificial Intelligence, Robotics and ICT. Massive digitisation infrastructures and High-Performance Computing will be coupled with Machine Learning techniques to produce a multiscale simulation of more than 5000 years of history. Miles of archives and museum collections will be transformed into a digital information system.

The so generated **Big Data of the Past** will enable us to deal with historical information in fundamentally new ways, particularly in the field of genealogy real revolutions will happen.

Four experts from the Time Machine consortium are keen on sharing their vision and exemplary ideas with the audience:

- Fédérich Kaplan (EPFL): The Time Machine Project
- Dorit Raines (Cá Foscarì University, Venice): Unveiling Power Lobbies Through the Big Data of Genealogy
- Thomas Aigner (ICARUS): Archives as Huge Big Data Storages of the Past
- Sander Münster (TU Dresden): Landscape of Remembrance – Dresden and Terezín as Memorial Places of the Shoah



# The Time Machine Project

Frédéric Kaplan  
Ecole polytechnique fédérale de Lausanne

Time Machine aims to develop the Big Data of the Past, a huge distributed digital information system mapping the European social, cultural and geographical evolution across times. This large-scale digitisation and computing infrastructure will enable Europe to turn its long history, as well as its multilingualism and multiculturalism, into a living social and economic resource.

By pushing the frontiers of scientific research in Information and Communication Technologies (ICT) and in the Social Sciences and Humanities (SSH), Time Machine will strongly impact key sectors of European economy: ICT software, especially Augmented/Virtual Reality (AR/VR) applications; the creative industries; and tourism.

Moreover, it will offer new perspectives in urban planning, land management and developing smart cities.

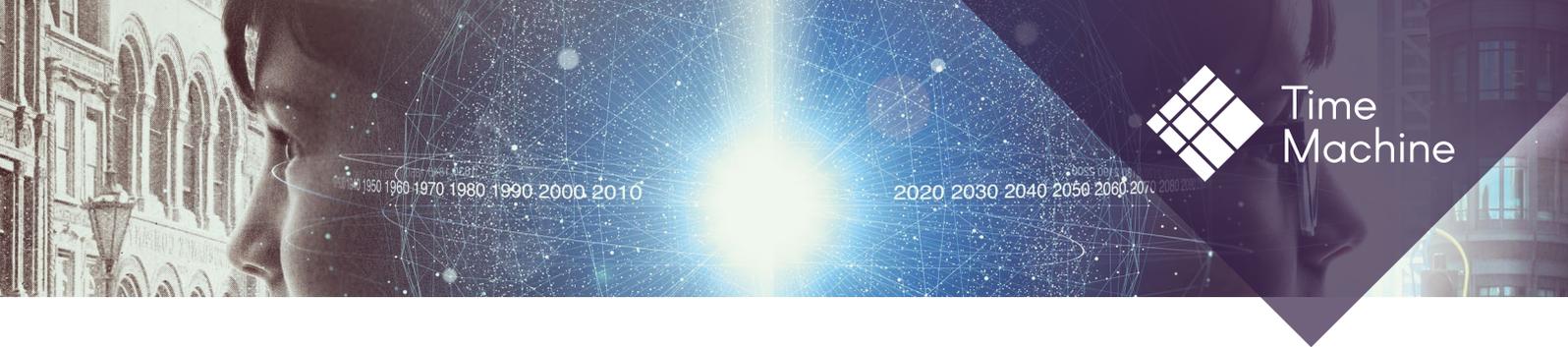
Time Machine will have strong positive long-term effects on European cohesion, economy and society, with concrete contributions to promoting critical thinking at all levels of decision making, to strengthening the feeling of European identity, as well as to boosting scientific and technological competitiveness, entrepreneurship and employment in knowledge intensive and creative sectors across the European Union.

## GOALS OF THE TIME MACHINE INITIATIVE

- Introduce a series of fundamental breakthroughs in Artificial Intelligence (AI) and ICT, making Europe the leader in the extraction and analysis of enormous sets of noisy, heterogeneous and complex data referring to our past and present activities and achievements.
- Enable Social Sciences and Humanities to address bigger issues, allowing new interpretative models that can smoothly transition between the micro-analysis of single artefacts and the large-scale complex networks of European history and culture.
- Be a driver of open science, as well as open (public) access to public resources.
- Provide a constant flux of knowledge that will have a profound effect on education, encouraging reflection on long trends and sharpening critical thinking.
- Act as an economic motor for new professions, services and products, impacting key sectors of European economy.

## KEY AREAS OF ACTION – THE RESEARCH AND INNOVATION PILLARS

- Addressing the scientific and technological challenges in AI, Robotics and ICT for social interaction, for developing the Big Data of the Past, while further advancing these key enabling.
- Designing and building the Time Machine operation, by putting in place the constituent parts of the Time Machine infrastructure and the management principles and processes for sustainable Time Machine communities across Europe and other parts of the world.
- Creating innovation platforms in promising application areas, by bringing together developers and users for the exploitation of scientific and technological achievements, and therefore leveraging the cultural, societal and economic impact of Time Machine.
- Developing favourable framework conditions for the outreach to all critical target groups, and for guiding and facilitating the uptake of research results produced in the course of the initiative.



# Archives as Huge Big Data Storages of the Past

Thomas Aigner  
ICARUS – International Centre for Archival Research

All the world talks about big data, be it with regard to huge companies collecting and processing huge amounts of data like Google, Amazon or Facebook, be it applications on everyone's mobile or even governments dealing with the data of their citizens. Talking about big data means digital data, of course, but isn't any information stored anywhere, even on paper, if it is about huge and massive amounts like entire archives, big data, too?

Let's imagine the thousands of kilometres of shelves kept in the archives all around the world – the information contained in its books, sheets, charters, pictures, maps etc. is huge and massive, but in contrast to the data Facebook deals with mostly not digital and therefore not stored on hard discs, but on simple physical media like paper or parchment.

All the information stored there is undoubtedly BIG DATA, too, but with the special property of not being digital. Therefore it has to be processed and researched manually sheet by sheet and so the power of digital big data technologies does not take into effect.

Let's keep on imagining and let's understand physical archives not just as collections of objects of various kinds, but as huge information storages. The information contained just needs to be released by making it digital and so the power of all existing and future big data technologies can be applied also on historical data captured in physical materials so far.

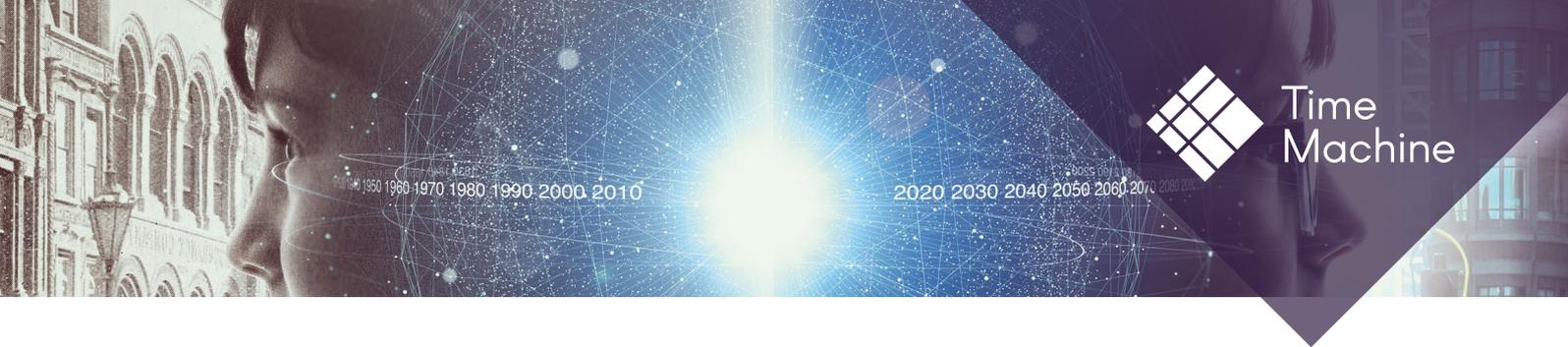
The time has come to develop hardware and software, that allows to digitise and further process huge and massive amounts of archival documents not only on a low budget basis but also very fast. This means not only the production of images, but also to extract and further process the information of the old writings contained. Artificial intelligence technologies will process the data so far that fundamental new insights in historical contexts will be possible.

For genealogical research this will be relevant in a very particular way, if we consider the following examples of sources:

1. Population registers, church registers
2. Land registers
3. Historical cadastral maps
4. Private documents and photos

Within these four types of sources you can find information on the entire lifetime of certain persons from their birth until their death. In the land registers and on old cadastral maps you can find exact information on the place when and where they lived, or even further information on the various circumstances of their lives. And moreover private documents and photos complement and illustrate that history.

If we had all those sources in digital form we could gain not only absolutely new insights in the lives of our ancestors, but also realize many new aspects and contexts we previously never would have been able to see in the analogue material.



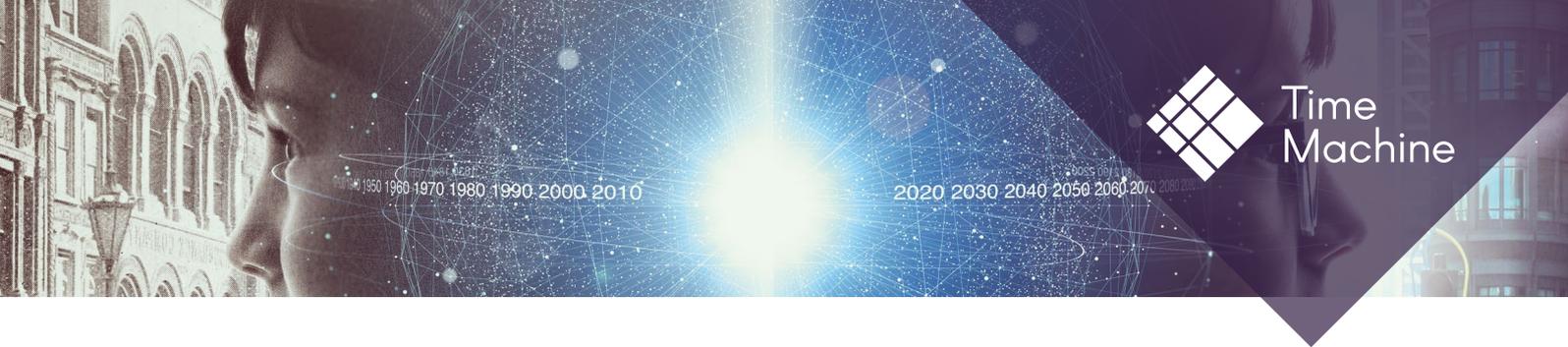
# Unveiling Power Lobbies Through the Big Data of Genealogy

Dorit Raines  
Università Ca' Foscari Venezia

The family tree is a sort of a graphic representation that describes relationships between persons belonging to the same family unit. Its main role in history was either social (discover one's ancestors and their descendance) or juridical (prove one's descendance). The Venetian nobility, however, as of the beginning of the sixteenth century, used genealogical trees for political purposes. The first to practice a collective genealogy (including in the same manuscript genealogical trees for all noble lineages according to their division into branches), based on State documents and intended as a sign of distinction of patrician families over others, was the Venetian patrician Marco Barbaro (1511-1570). The seventeenth century – following these genealogies - witnessed the launch of an unusual experiment: the introduction of an affinal genealogy, based on bonds of marriage, for the purpose of using these parental networks in elections for offices. With the growing importance of the family branch on the political scene and the numerical decline of patronymic lineages, a new genealogical product of matrilineal nature, named the “affinal kinship books”, circulated in Venice: at least thirteen books prepared by Francesco Barbaro (Marco Barbaro's kin) between 1637 and 1650 for families of influential patricians. The idea was simple: the patrician “sponsor” of the work was put at the center of a family tree that listed all relatives by marriage, his parents, grandparents, sons and grandchildren, and their relationship to other families. On the whole, in average, for each “sponsor”, Barbaro listed twelve branches of different families, with - for each one - a tree of seven-eight generations, for a total of 240 parents on which the patrician “sponsor” could count during the political elections.

The author of the “affinal kinship books” did not use the genealogical instrument he had created solely to draw the relationships between parents within the “sponsor's” own family but proceeded to register marriages and family ties created through marriage, generating a long chain of relationships between several branches of different families. As a result, he could demonstrate the length of the relationship between branches of patronymic families following matrimonial alliances (by calculating not only the generation in question but going backwards in time to the fourth generation, as was the Venetian custom), but also its intensity (and therefore the number of electors in the Great Council for the election of a Doge or other senior offices). However, despite the efforts of the author of these exceptional “affinal kinship books” to offer an instrument of socio-political analysis to the patrician sponsor, he was not able to transform the data contained in the trees of marriage relations into an analytical graph, which would have discovered structural relationships, invisible until then.

Today, with the help of network analysis and TM's big data of the past, one can use the data recorded by Francesco Barbaro to unveil power lobbies and political bonds between families. Departing from the data included in an “affinal kinship book” prepared in 1638 for the patrician Anzolo Contarini di San Benetto, brother of future Doge Domenico (1585- 1675), the presentation intends to describe the knots that are formed at the time of marriages, the centrality of certain connections, the importance or lack of it of the length or distance between persons, the intensity of connections, the hierarchy of relationships between generations. All these elements outline the structure of kinship networks that contributed to Domenico Contarini's election to doge in 1659. The potentiality of this source becomes a starting point for the description of an affinal kinship network able to register – with the help of the patrilinear genealogical trees - the changes occurred (new marriage contracts, the abandonment after four generations of the affinal kinship bond) and thus the structural movements (changes of power alliances, new balance of power, the different criteria used for the stipulation of marriage contracts, such for example the size of the dowry contracts) inside the Venetian governing elite.



# Landscape of Remembrance – Dresden and Terezín as Memorial Places of the Shoah

Sander Münster  
TU Dresden

In the history of the city of Dresden in the 20th century the years between 1933 and 1945 mark a deep cut shaping the cityscape immensely and irrevocably. The trauma of the destruction on February, 13th and 14th in 1945 is mainly part of the commemorative culture of the city; but since Viktor Klemperer's precise diary-entries of the destiny of the persecuted Jews in Dresden were published, the Shoah became very apparent to the city's public, too. The Saxon Memorial Foundation presents a voluminous collection of documents and archive material on the topic of Jews in Dresden that helps to commemorate the Shoah in and around Dresden. The visit of the Terezín Memorial in the Czech Republic is also an important part of Saxon education strategies. In 1947 the National Suffering Memorial in Terezín was opened on the site of the suffering of tens of thousands; it was later on renamed the Terezín Memorial and ever since it has been a major memorial place of the crimes of National Socialists in Central and Eastern Europe. At the same time, the Terezín Memorial is an important place to focus on understanding and reconciliation, regarding the relations of the neighbouring countries Germany and Czech Republic.

With a cross-border project these two significant places of commemorative culture of the Shoah were linked. In cooperation between the Terezín Memorial, the Technical University in Dresden (particularly the Institute for Central-European Studies & the Media Center) and the University of West-Bohemia in Plzeň a multimedia-presentation will be compiled, funded by the Ziel3/Cíl 3-support program of cross-border cooperation between the Free State of Saxony and the Czech Republic.

The result of the project was a 3D-model of a 'landscape of remembrance' that represents the memorial places for the memory of the victims of those terrible crimes, committed during the 1930's and 1940's in the Bohemian-Saxon border region. The three-dimensional map will integrate 3D-models of the cities Terezín and Dresden, historical information and objects in a multimedia-based model. The model will be presented partly on the internet and partly through local information points at the Terezín Memorial and the Münchner Platz Dresden Memorial.

On the one hand, the present cityscape of Dresden will become transparent for its history, for guilt and responsibility. On the other hand, the huge volume of knowledge collected by the Terezín Memorial in 50 years of archival and historical work will become available to the public. The project wants to give a voice to the memories of the past for visitors from around the world, but explicitly for the younger generation.

The envisioned presentation will (a) showcasing project results and particularly the related concept to visually link biographies and places to teach about the Shoah. From a technological point the application is based on an automated VR pipeline utilizing historical photographs and resulting in an interactive browser-based device-rendered 4D visualization and information system for desktop browsers and mobile devices. Since these workflows are adoptable to other scenarios as virtual cultural heritage tourism and capable to support scholarly research on city inhabitants and places, a second aspect will be to (b) showcase and discuss potential usage scenarios in the field of genealogical research and information.