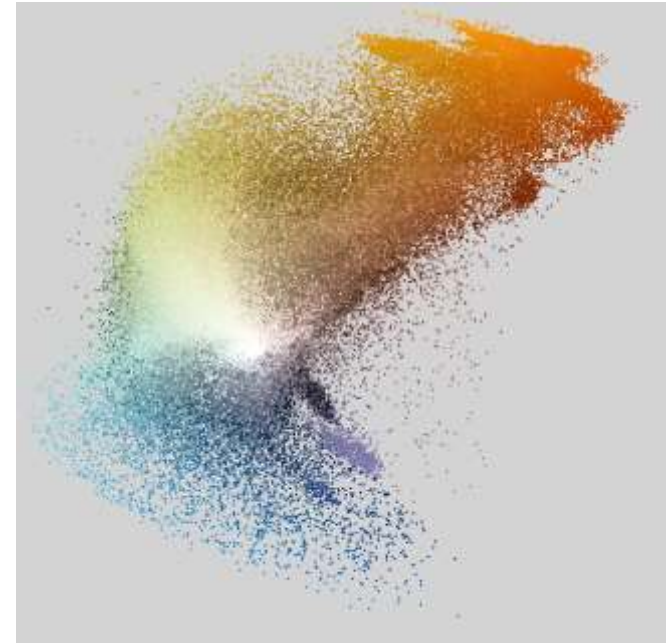
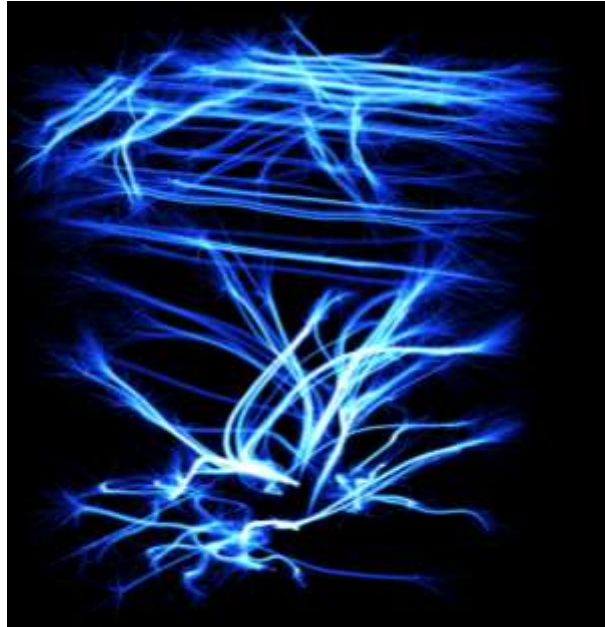
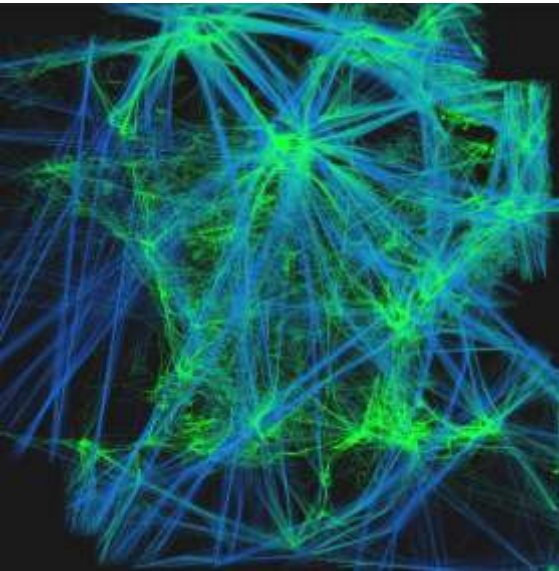


DaQuaTa International Workshop 2017

# Pixel Based techniques to support interactive data exploration and cleaning



12<sup>th</sup> December 2017

**Christophe Hurter**

*Professor*

*ENAC- Ecole Nationale de l'Aviation Civile*

*Toulouse, France*

[Christophe.hurter@enac.fr](mailto:Christophe.hurter@enac.fr)

<http://recherche.enac.fr/~hurter/>



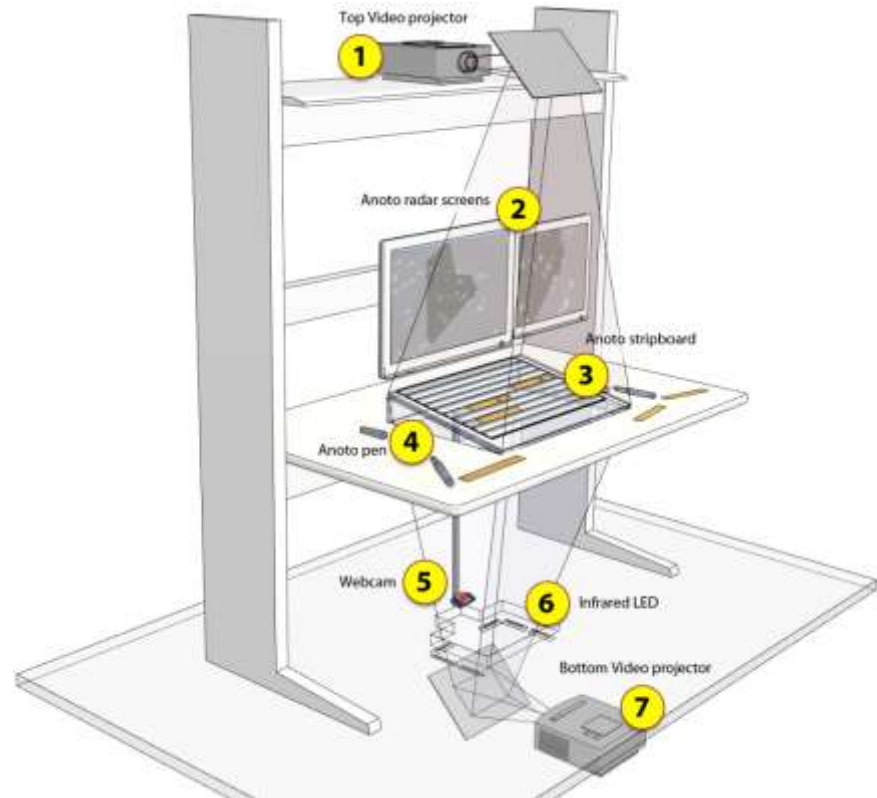






# Strip'TIC

## Exploring Augmented Paper Strips For Air Traffic Controllers



# Strip'TIC: digital Paper Strip



Catherine Letondal, Christophe Hurter, Jean-Luc Vinot, Rémi Lesbordes and Stéphane Conversy  
**Strip'TIC: designing a paper-based tangible interactive space for air traffic controllers.**  
(CHI 2013) In *Proceedings of ACM SIGCHI 2013*,

Christophe Hurter, Remi Lesbordes, Catherine Letondal, Jean-Luc Vinot and Stephane Conversy.  
**Strip'TIC: Exploring Automatic Paper Strip for Air Traffic Controllers.**

(AVI 2012) *Advanced Visual Interface. AVI 2012. , Advanced Visual Interfaces, Capri, Italy, ACM Press.*



## Remote / Augmented Tower



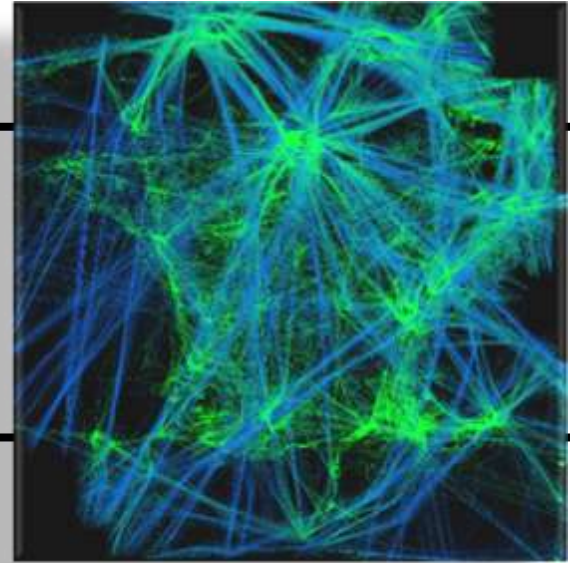






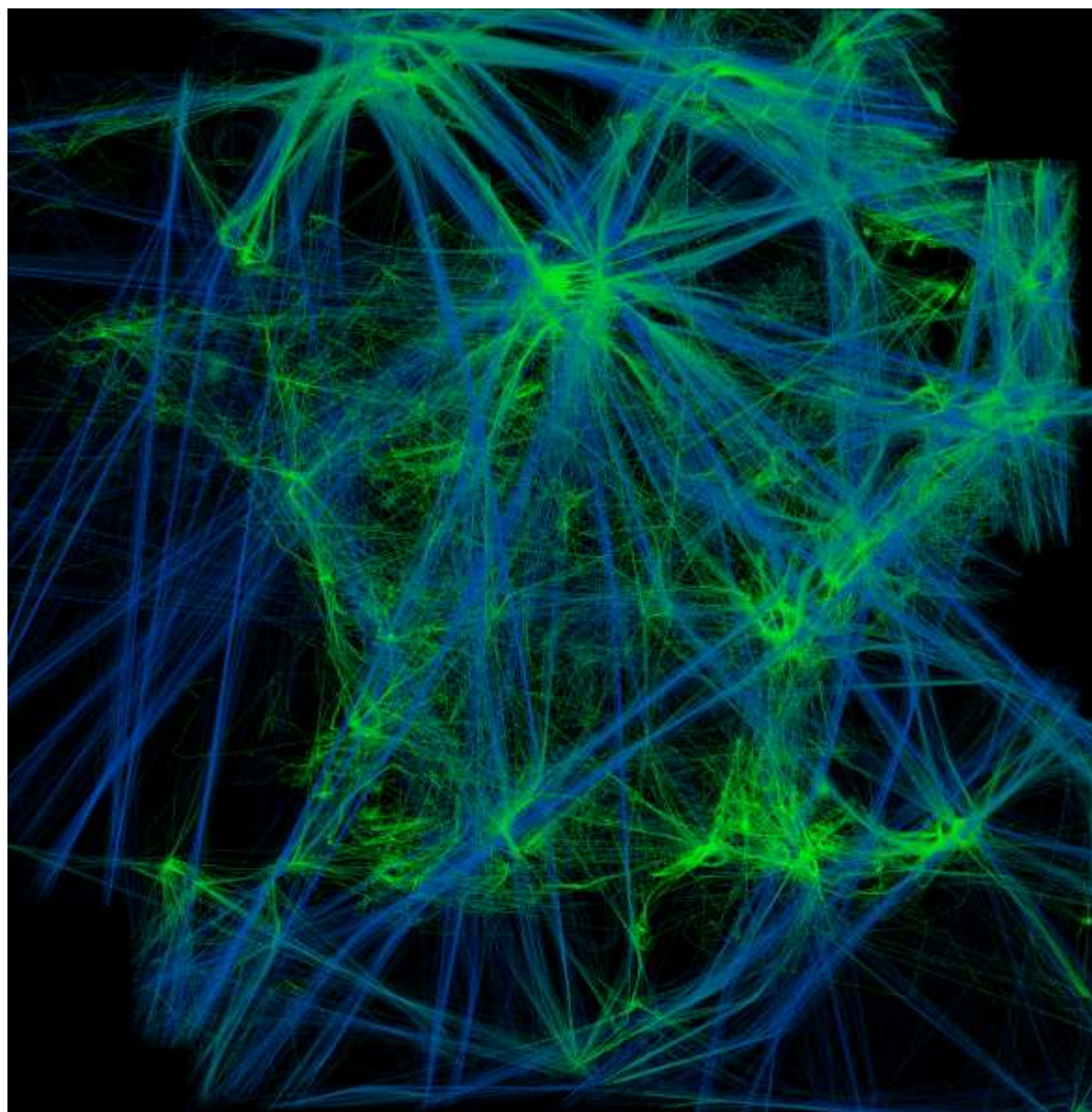


# ATC Data





*from Data  
to Display*



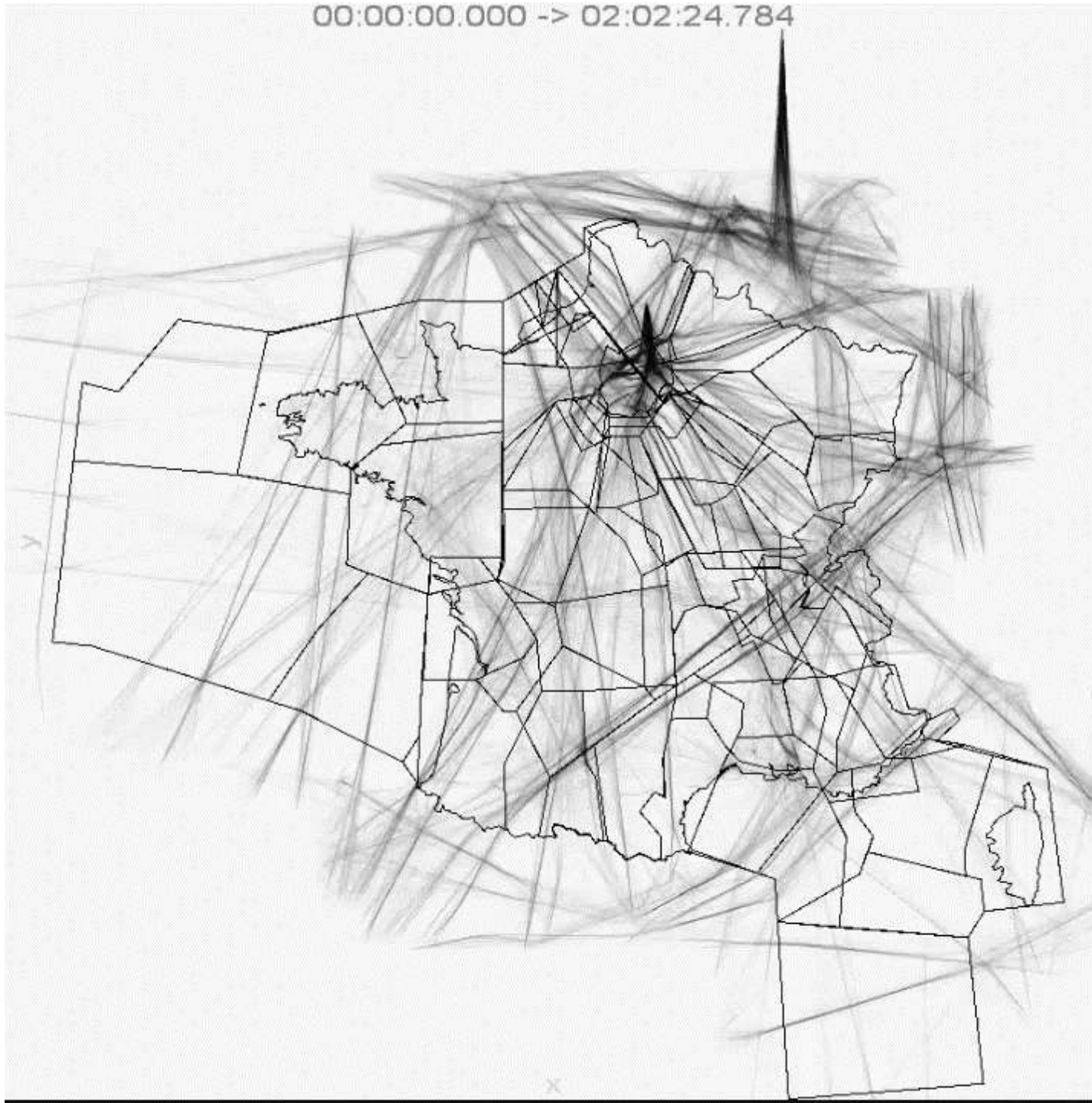
Hurter, C., Tissoires, B., Conversy, S.

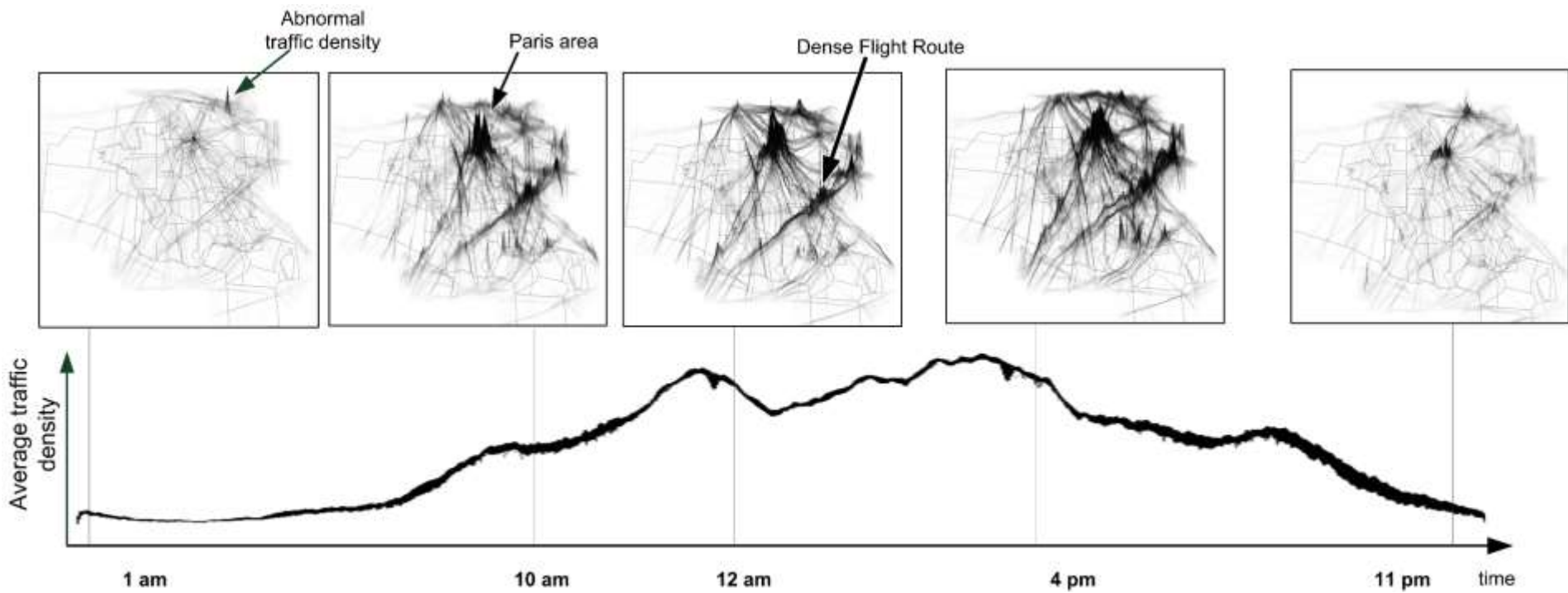
**FromDaDy: spreading data across views to support iterative exploration of aircraft trajectories.**

*In IEEE Transactions on Visualization and Computer Graphics xx(y), (Proceedings of IEEE InfoVis 2009).*

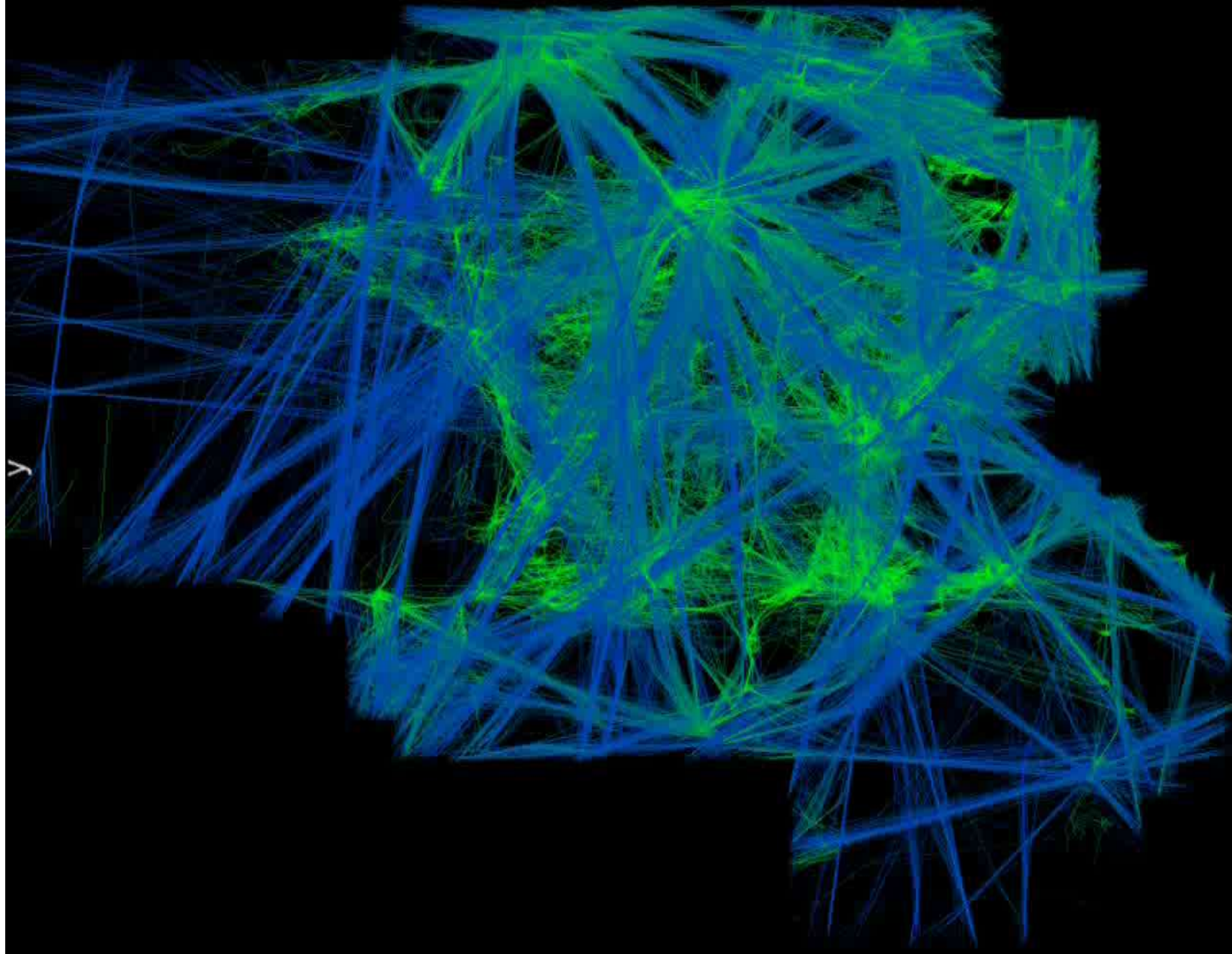


00:00:00.000 -> 02:02:24.784



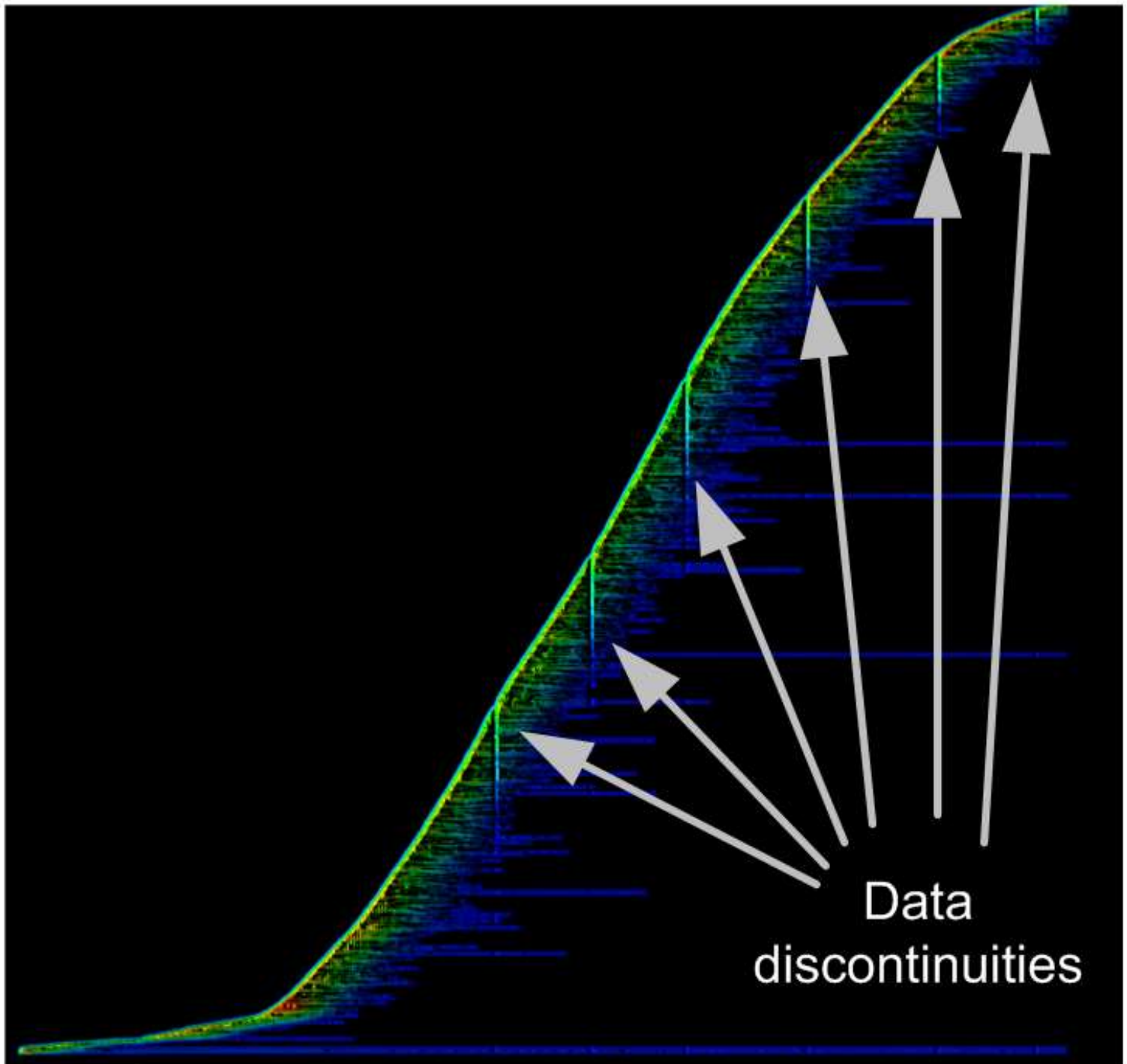


# Eclairage dynamique

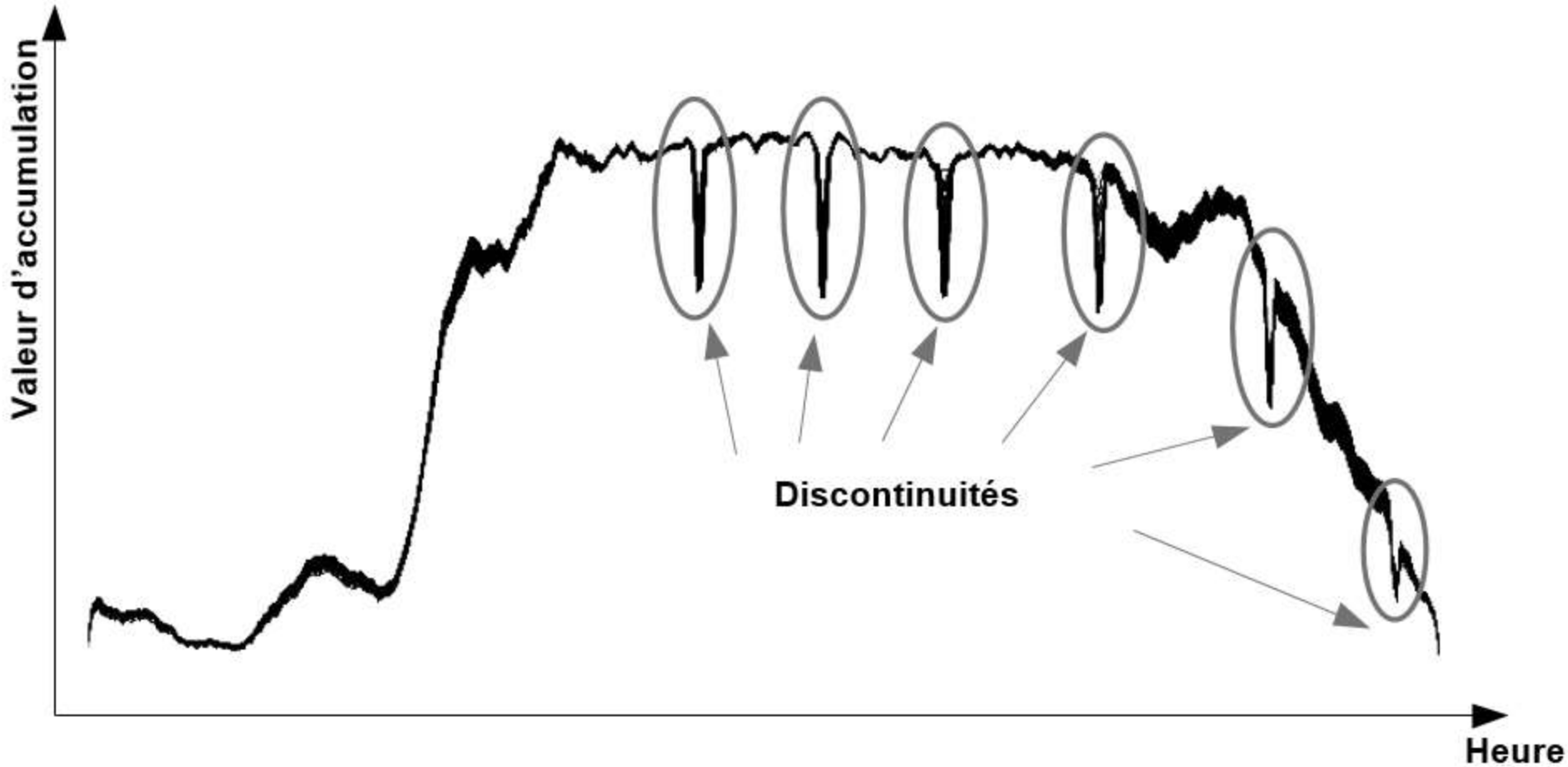


x





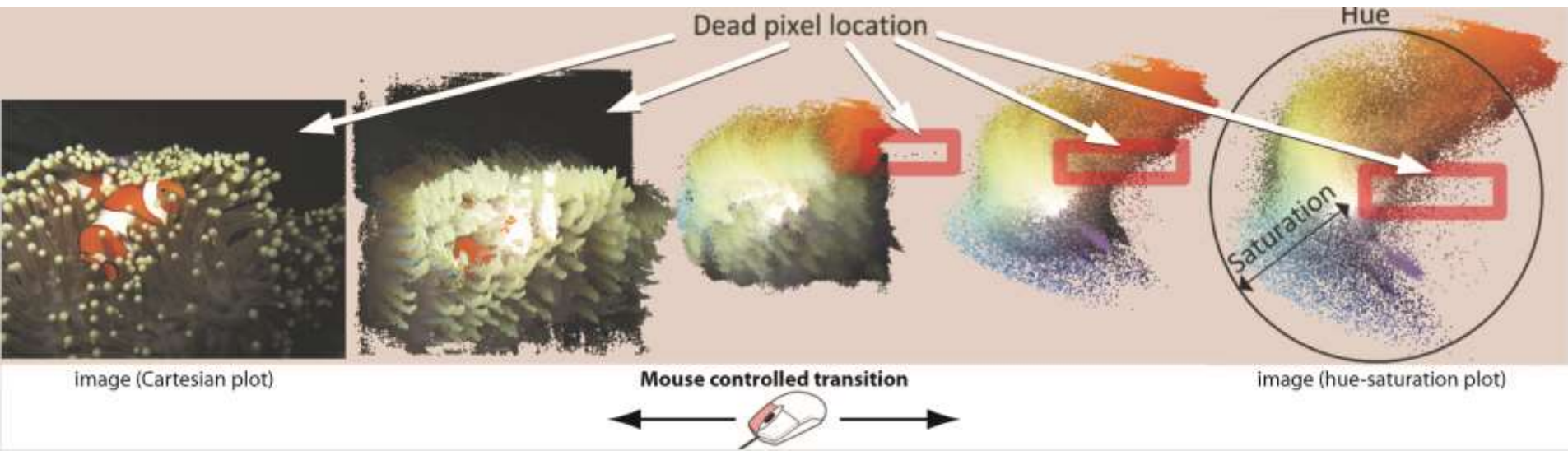
Data  
discontinuities



# Image Data







C. Hurter, A. R. Taylor, S. Carpendale and A. Telea

**Color Tunneling : Interactive Exploration and Selection in Volumetric Datasets**

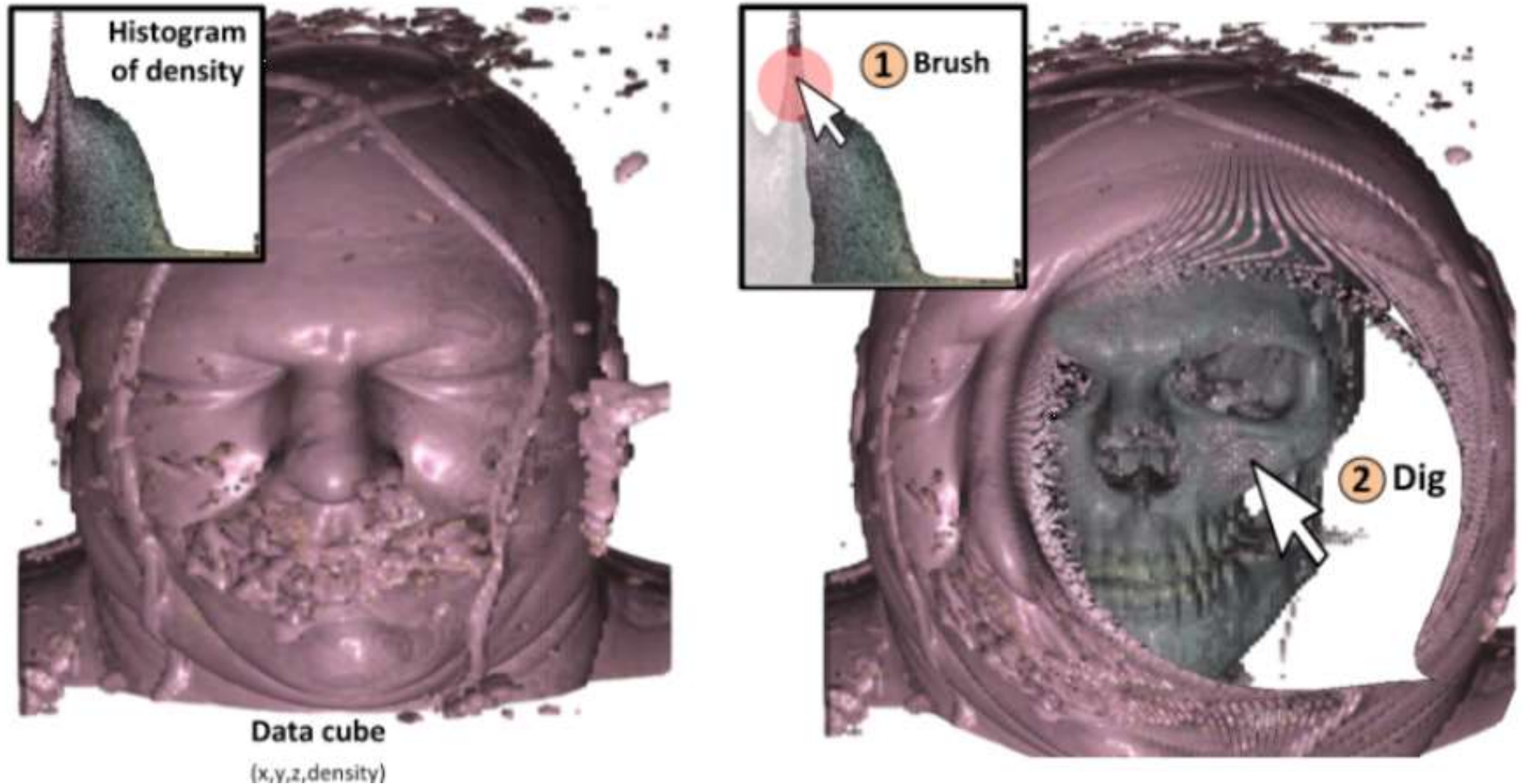
*PacificVis 2014*

# Medical Data



# Color Tunneling

Point based visualization technique



C. Hurter, A. R. Taylor, S. Carpendale and A. Telea

**Color Tunneling : Interactive Exploration and Selection in Volumetric Datasets**

*PacificVis 2014*



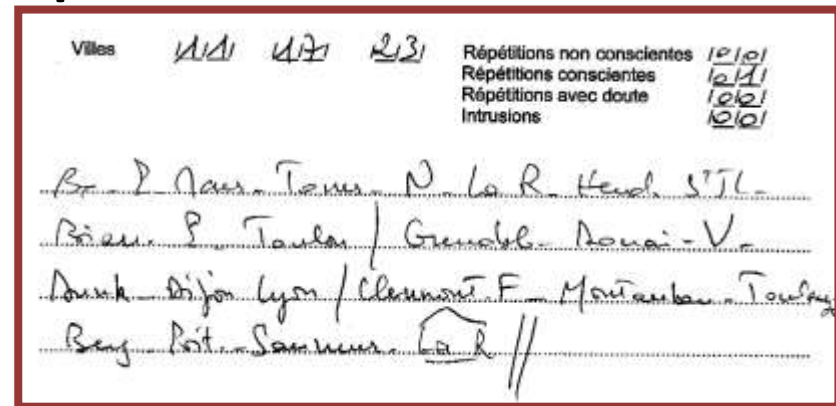


# Context & Motivation

Study of **AD** (Alzheimer's Disease) is a **major societal challenge**

**Our study** uses the 3C Cohort

French National study on **9500 people**



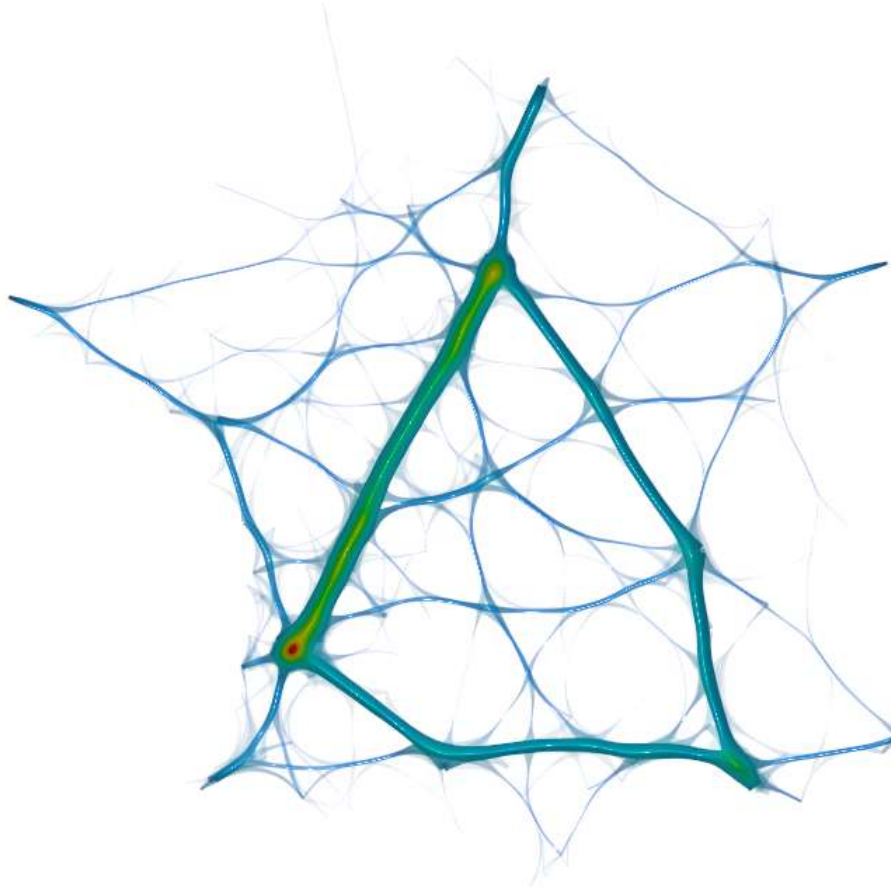
Focuses on **Verbal Fluency Tests**

Is a **representation** of a patient Cognitive Maps (Isaacs and Akhtar, 1972)

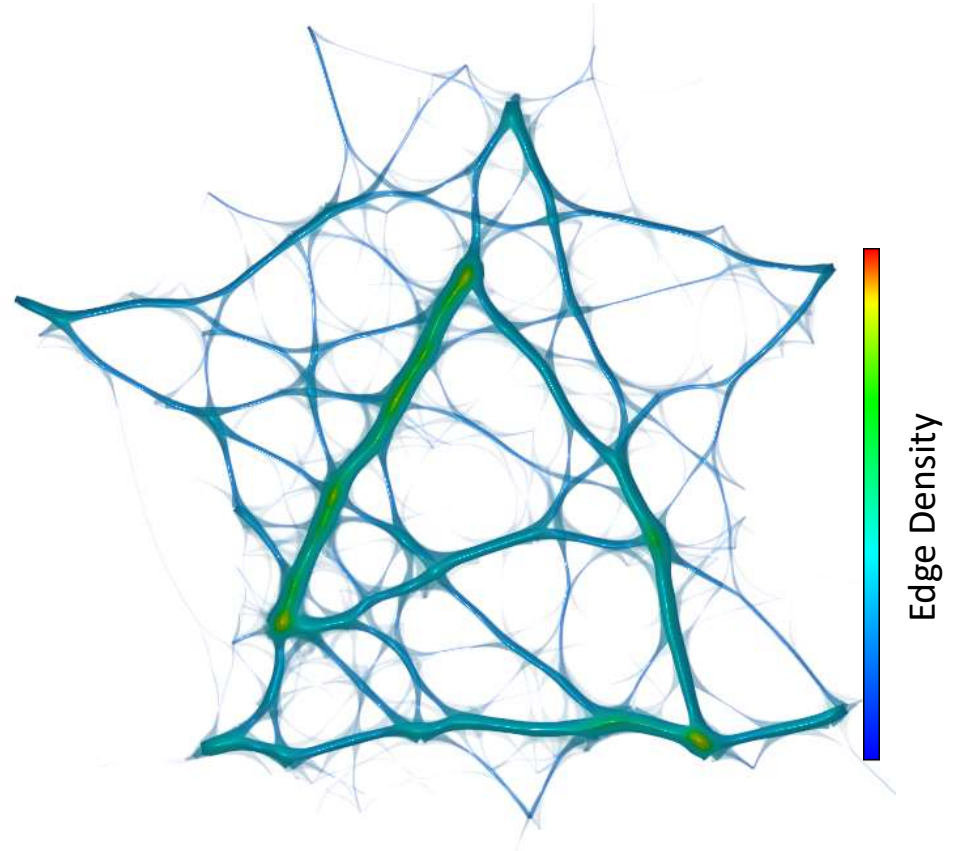
As **AD affects Cognitive Maps**, we will be able to study it.

*Our Goal; Study the geo-spatial distribution of the citations trajectories*

# Visualizing Fluency Test

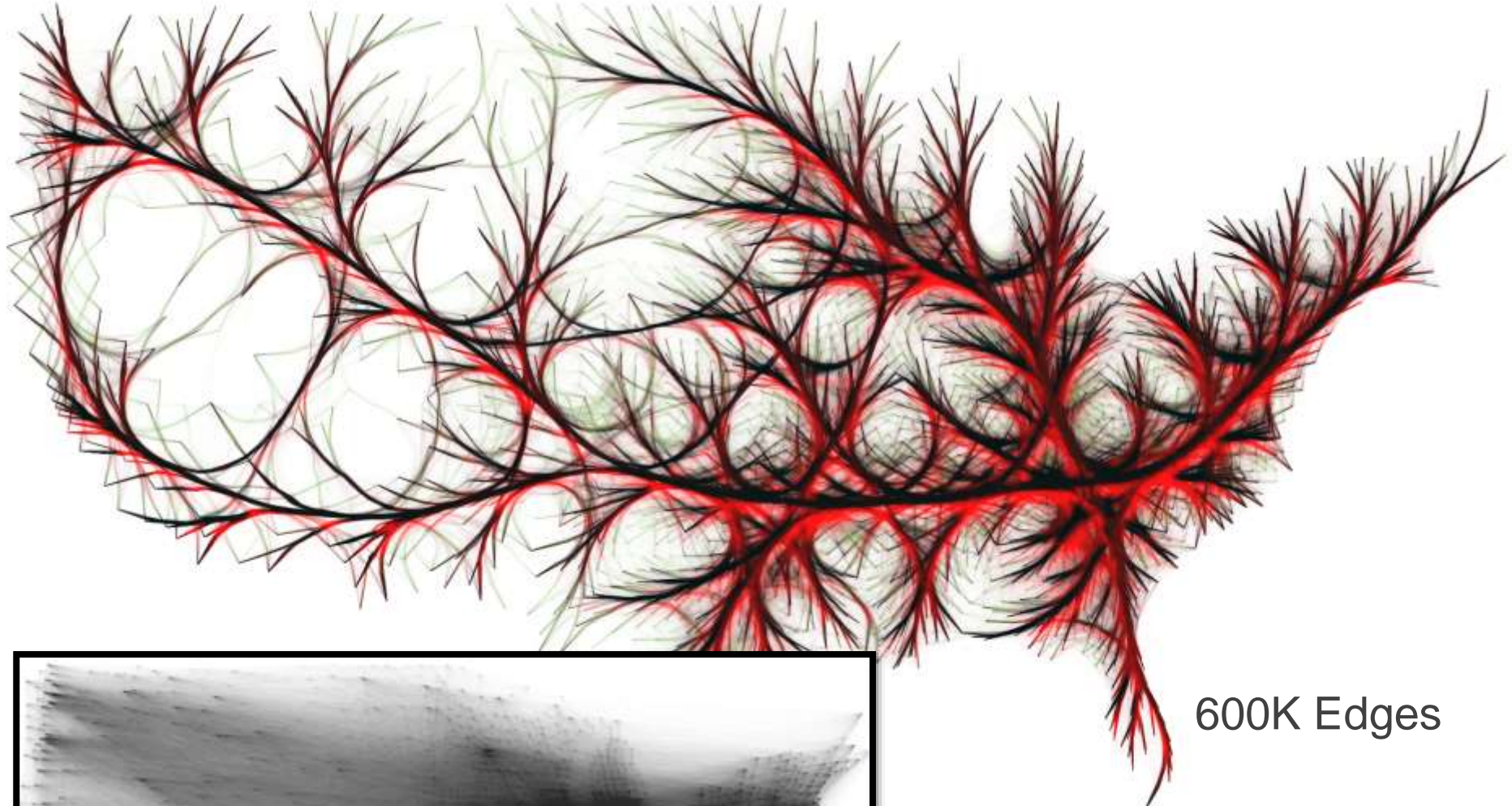


(A) Alzheimer group



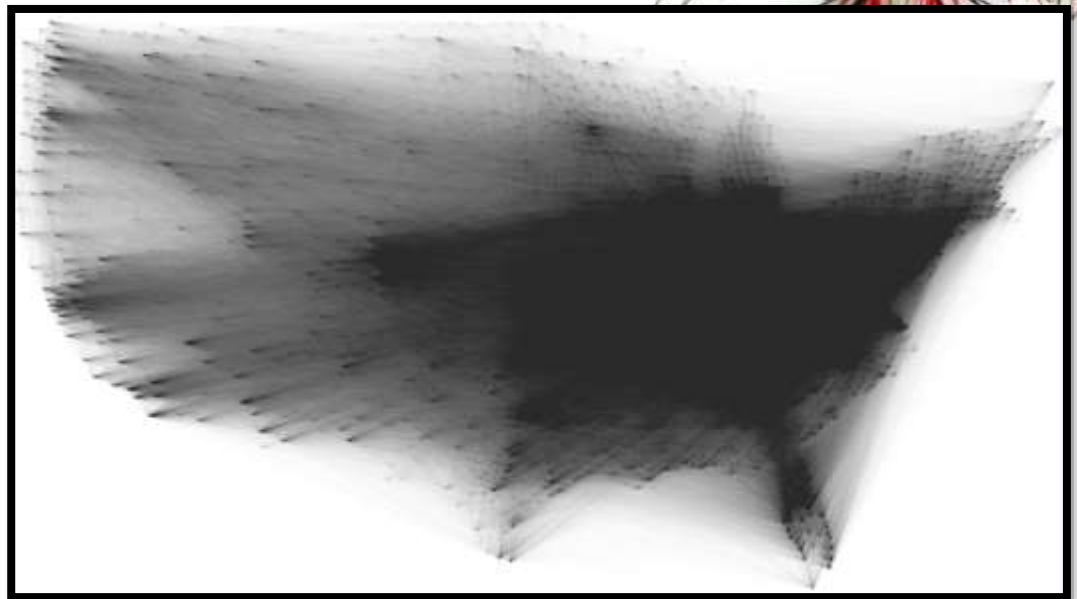
(B) Control group

Edge Density



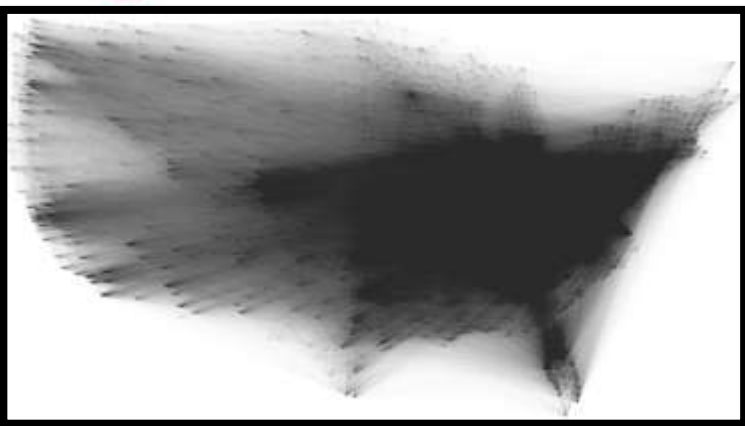
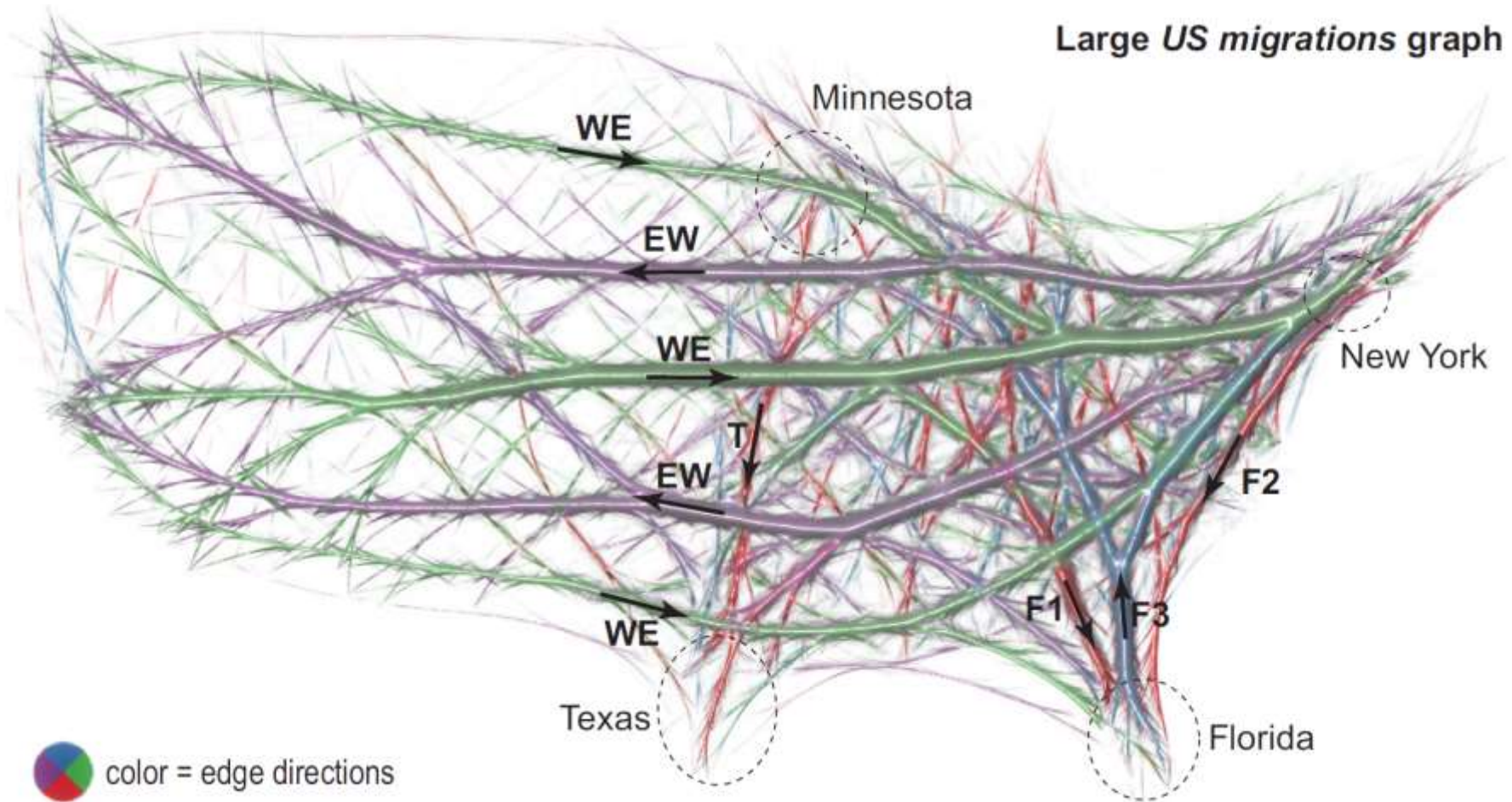
600K Edges

63 Billions Points





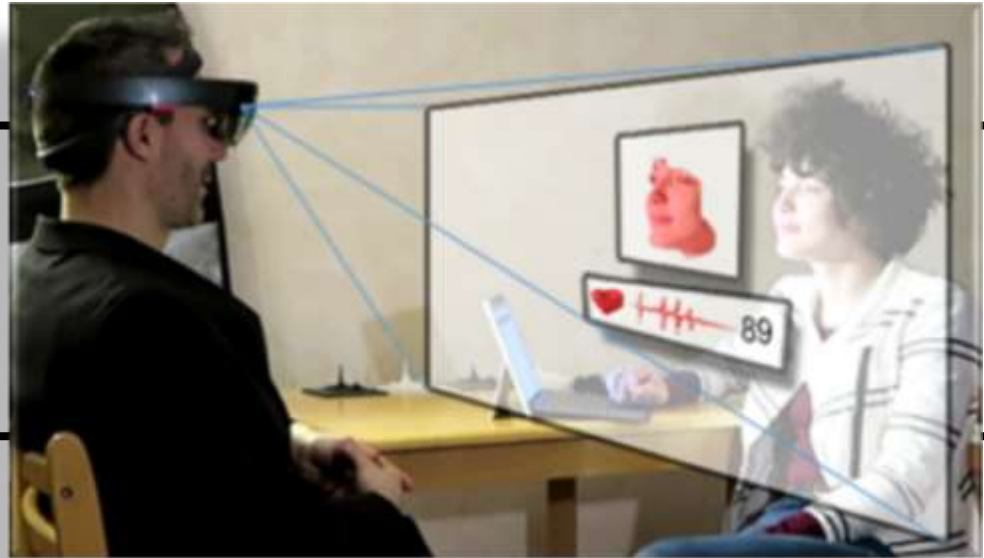
# Large US migrations graph



A. Lhuillier, C. Hurter, A. Telea. **FFTEB: Edge Bundling of Huge Graphs by the Fast Fourier Transform.** *PacificVis 2017, 10th IEEE Pacific Visualization Symposium*, Apr 2017, Seoul, South Korea. IEEE.



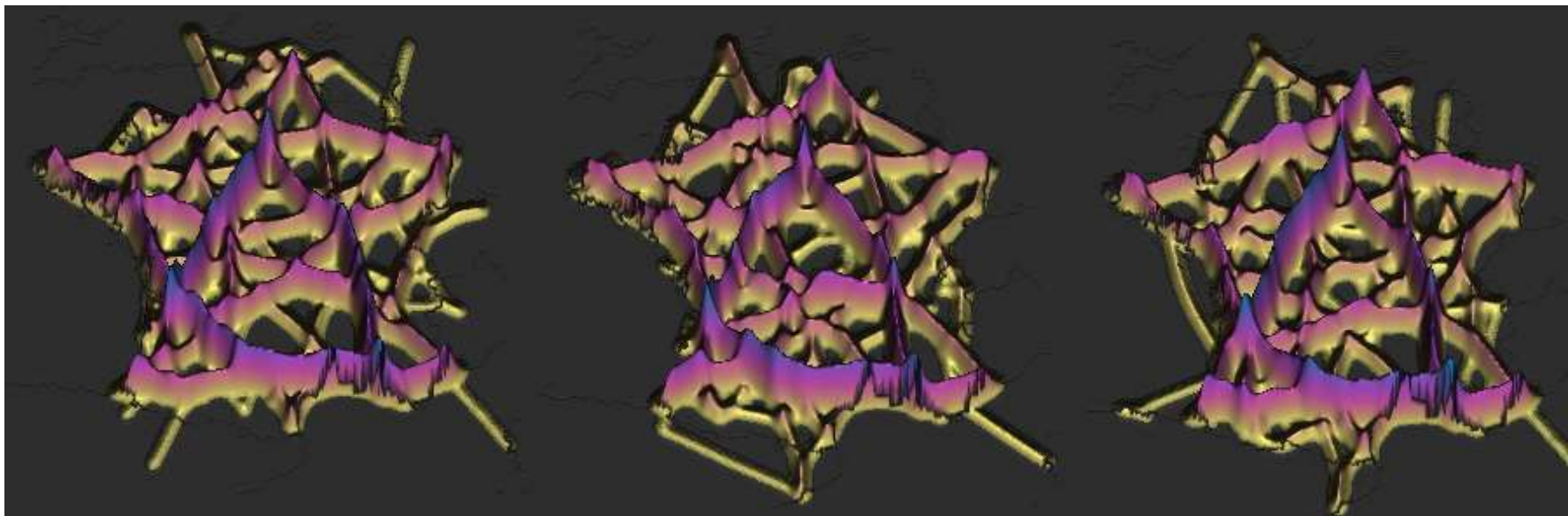
# The Future



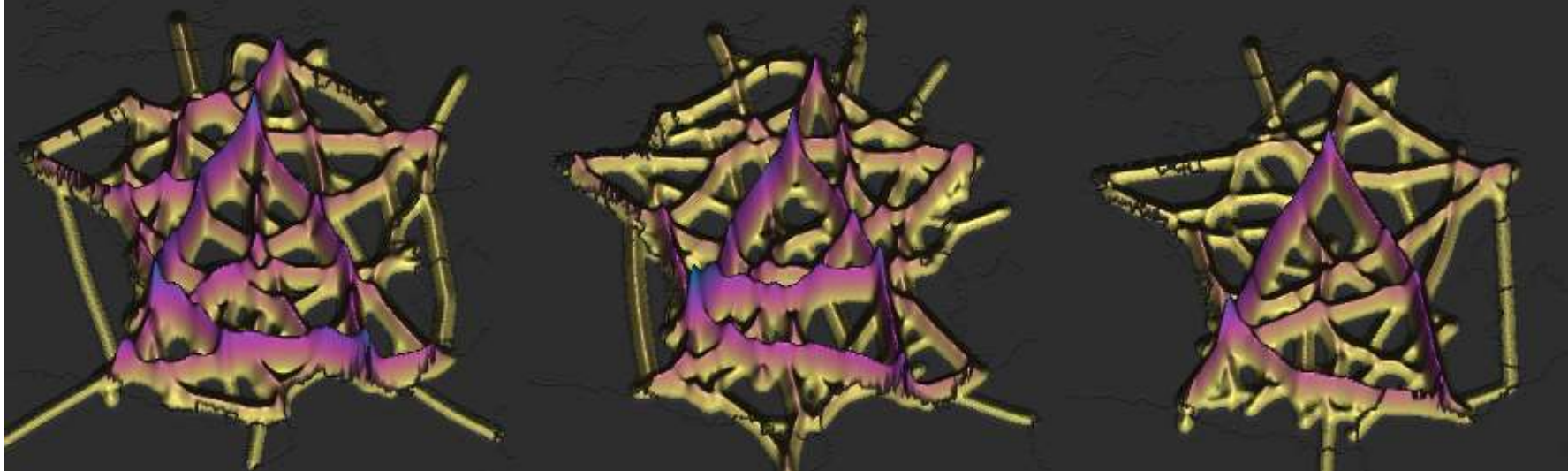


# Alzheimer disease

Non dement



dement



T8

T4

T0

dement

Non dement

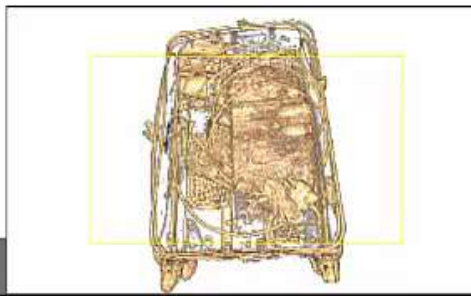
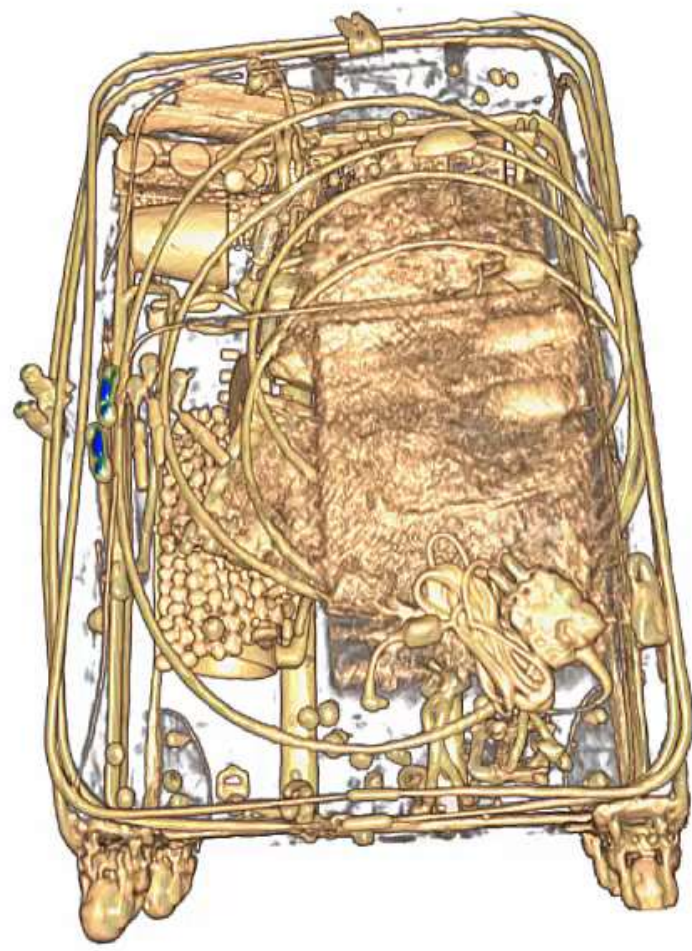
T0



T8

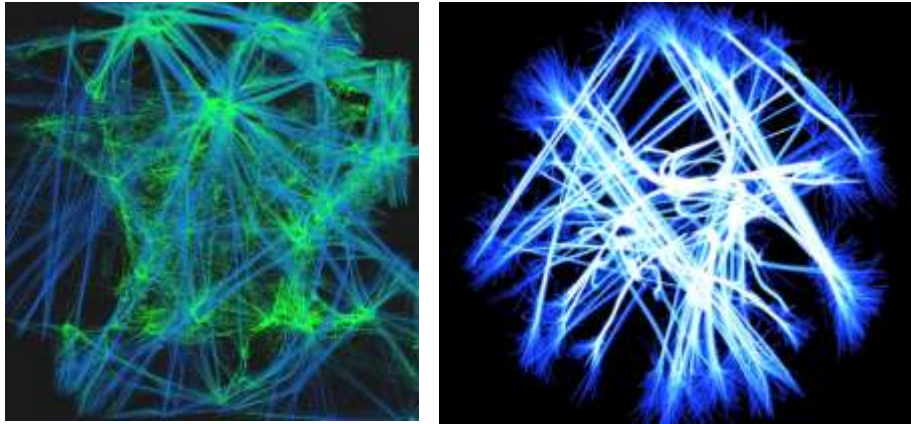






Michael Traore and Christophe Hurter. 2017. **Interactive Exploration of 3D Scanned Baggage**. *IEEE Comput. Graph. Appl.* 37, 1 (January 2017), 27-33.

# Interactive Multidimensional Big Data



**Data Analytics**



**Immersive Analytics**



**Safety**



**Personal Data**

# How to support data cleaning?

The key to supporting this task is not only to **visualize data**, but also to allow users to **interact with them**.

I explored new computing techniques called **pixel-based algorithms** so as to support efficient interactive visualizations for the exploration of **large datasets**.

# Contact

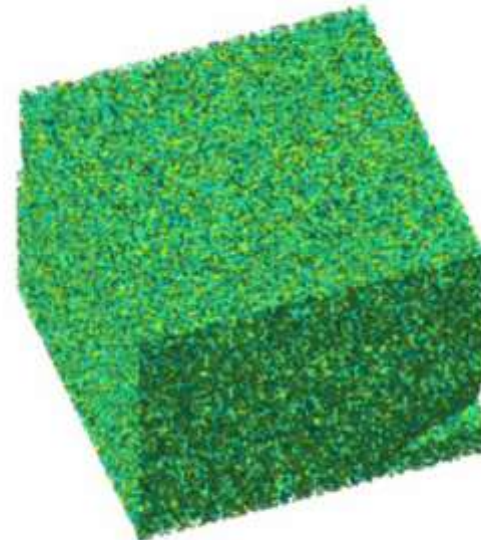


**Christophe Hurter**

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 MORGAN & CLAYPOOL PUBLISHERS

**Image-Based Visualization**  
*Interactive Multidimensional  
Data Exploration*

Christophe Hurter

SYNTHESIS LECTURES ON VISUALIZATION

Niklas Elmquist & David Ebert, Series Editors

*Christophe Hurter*

**Image-Based Visualization: Interactive  
Multidimensional Data Exploration.**  
[Synthesis Lectures on Visualization](#),  
Morgan & Claypool Publishers 2015