Connecting The Dots
Showing Relationships in Data and Beyond

Marc Streit[1], Hans-Jörg Schulz[2], Alexander Lex[3]

VisWeek Tutorial 2012

1. Johannes Kepler University Linz, Austria
2. University of Rostock, Germany
3. Harvard School of Engineering and Applied Sciences, Cambridge, MA, USA

Motivation

Common task in data analysis and many kinds of information intensive work:

> Compare, evaluate and interpret
> **related pieces of information**

LET'S START WITH A LITTLE GAME…

Do you know this guy?

Wally

Walter

Waldo

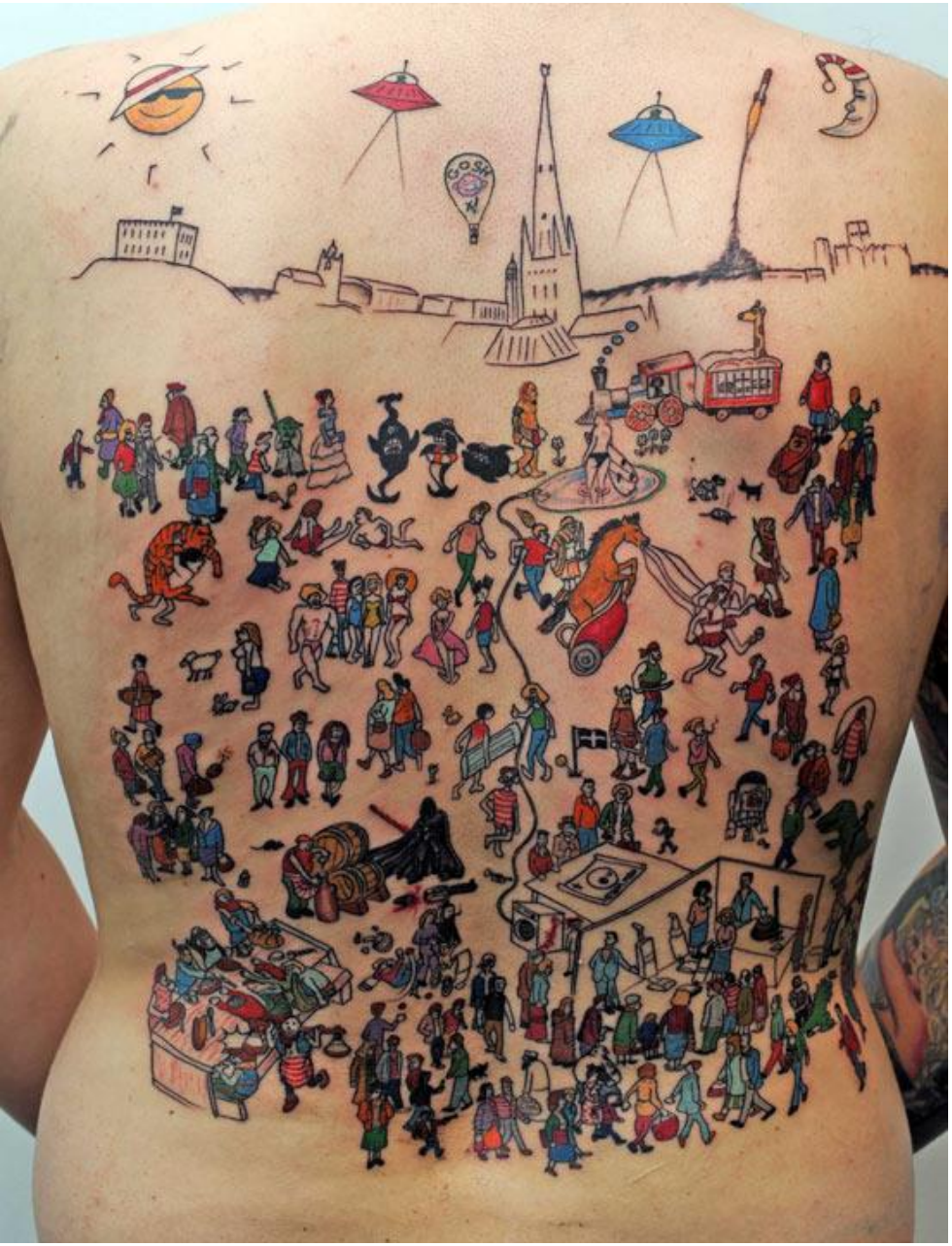
Holger

…

http://www.classicmedia.tv/pr/whereswaldo/

http://www.findwaldo.com/fankit/graphics/

http://tomsvision.wordpress.com/tag/wheres-wally/



In case you wanna have a tattoo…

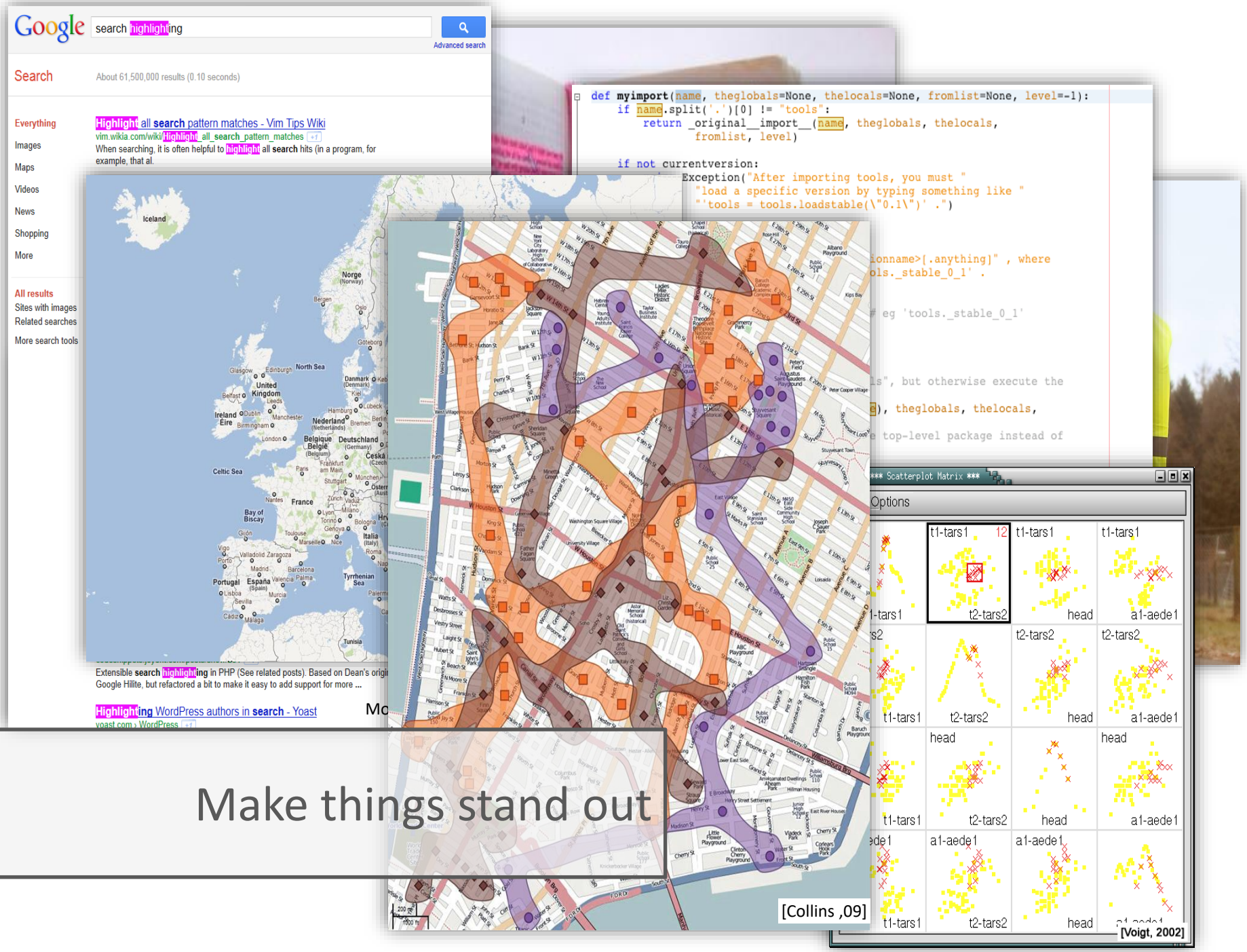
Spot the differences

Comparison Task

What's the Problem?

Finding, comparing and interpreting information is error-prone and tedious

→ Support human



Make things stand out

Overview

PART 1: What to link?

Defining Common Relations

PART 2: How to link?

Representing Relation on View Level

PART 3: When to link?

Cases in which Linking is Beneficial

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Part 1: What to Link?

1. **Entities/Elements (what is linked?)**
   – data items, clusters, datasets…
2. **Cardinality (how many are linked?)**
   – binary or n-ary (n>2)
3. **Domain (where do the links stem from?)**
   – data, view, interaction

About Ourselves: Hans-Jörg Schulz

MSc+PhD in Rostock (Topic: Graph Visualization)

Currently researcher at the University of Rostock working on visualization of heterogeneous data (funded by the German Research Foundation DFG)

What he does when the DFG is not looking:

- tree visualization survey: http://treevis.net
- visualization design spaces
- visualization for the biological domain

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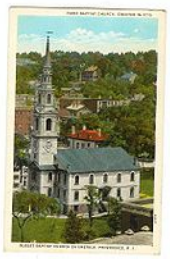
pedia.org/wiki/Providence,_Rhode_Island



First Baptist Church in America, founded 1638, present building occupied in 1776, is the oldest Baptist congregation in America

The area which is now Providence was first settled in June 1636 by Roger Williams, and was one of the original Thirteen Colonies of the United States.[10] Although the west bank of the Providence River was later claimed by both the English and the Dutch, the actual inhabitants and true masters of the region were the Pokanoket Tribe of the Wampanoag Nation led by Massasoit Ousamequin.[11] Williams secured permission to settle from the Pokanoket and gave the city its present name.[12] Williams' Providence soon became a refuge for persecuted religious dissenters, as he himself had been exiled from Massachusetts.[13] Providence's growth would be slow during the next quarter-century—the subsuming of its territory into surrounding towns, difficulty of farming the land, and differing of local traditions and land conflicts all slowed development.[13]

In the mid-1770s, the British government levied taxes that impeded Providence's maritime, fishing and agricultural industries, the mainstay of the city's economy. One example was the Sugar Act, which was a tax levied against Providence's distilleries that adversely affected its trade in rum and slaves. These taxes caused Providence to join the other colonies in renouncing allegiance to the British Crown. In response to enforcement of unpopular trade laws, Providence residents spilled the first blood of the American Revolution in the notorious Gaspée Affair of 1772.[13]

Providence in the mid-nineteenth century

Though during the Revolutionary War the city escaped enemy occupation, the capture of nearby Newport disrupted industry and kept the population on alert. Troops were quartered for various campaigns and Brown University's University Hall was used as a barracks and military hospital.[13]

NPS map of the W3R Route

After departing from Newport, French troops sent by King Louis XVI and commanded by the Comte de Rochambeau passed through Providence on their way to join the attack against British forces. The march from Newport to Providence was the beginning of a campaign led jointly by General George Washington in a decisive march that ended with the defeat of General Cornwallis in the Siege of Yorktown at Yorktown, Virginia and the Battle of the Chesapeake.

Following the war, Providence was the country's ninth-largest city.[b][13] with 7,614 people. The economy shifted from maritime endeavors to manufacturing, particularly machinery, tools, silverware, jewelry and textiles. By the turn of the twentieth century, Providence boasted some of the largest manufacturing plants in the country, including Brown & Sharpe

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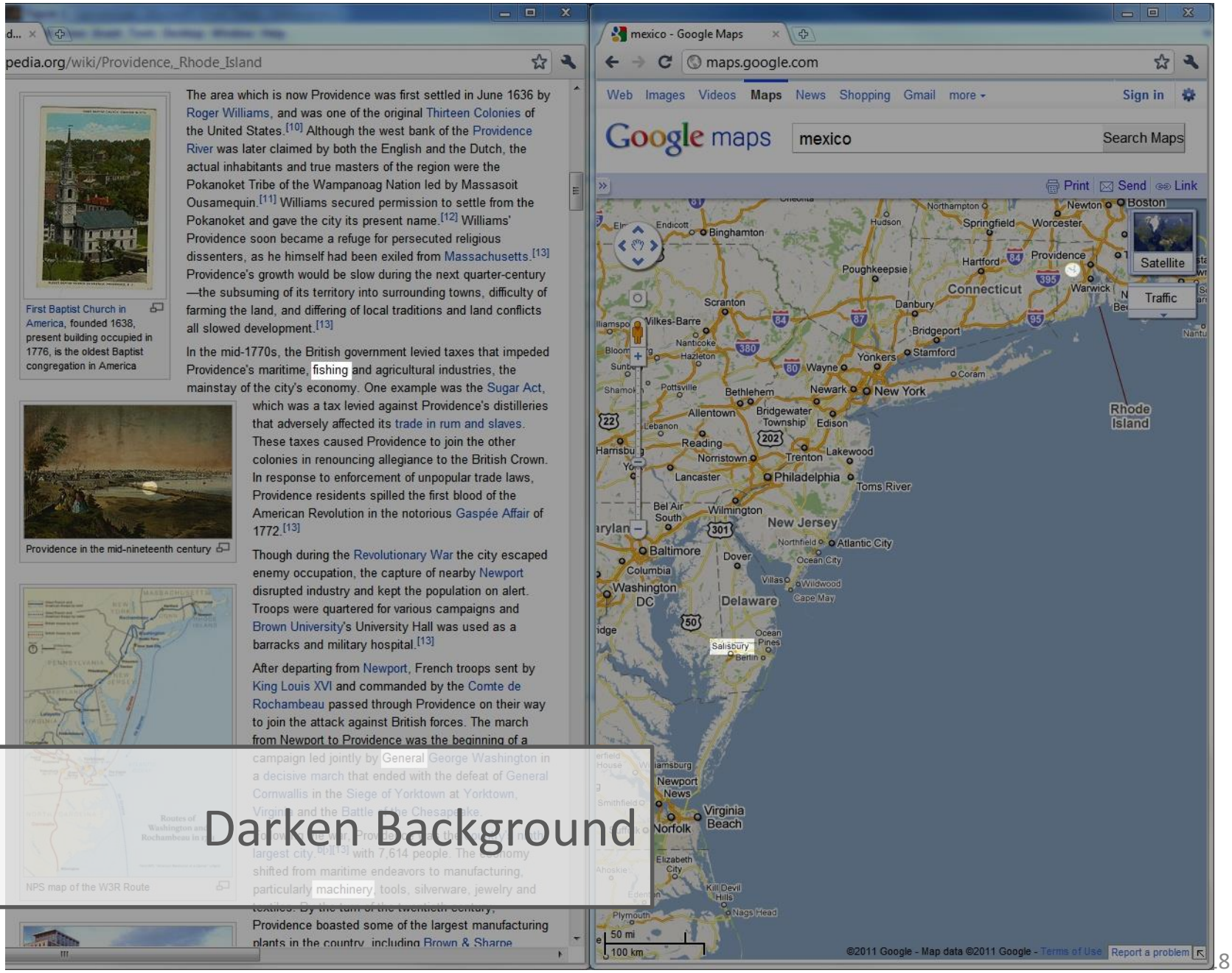
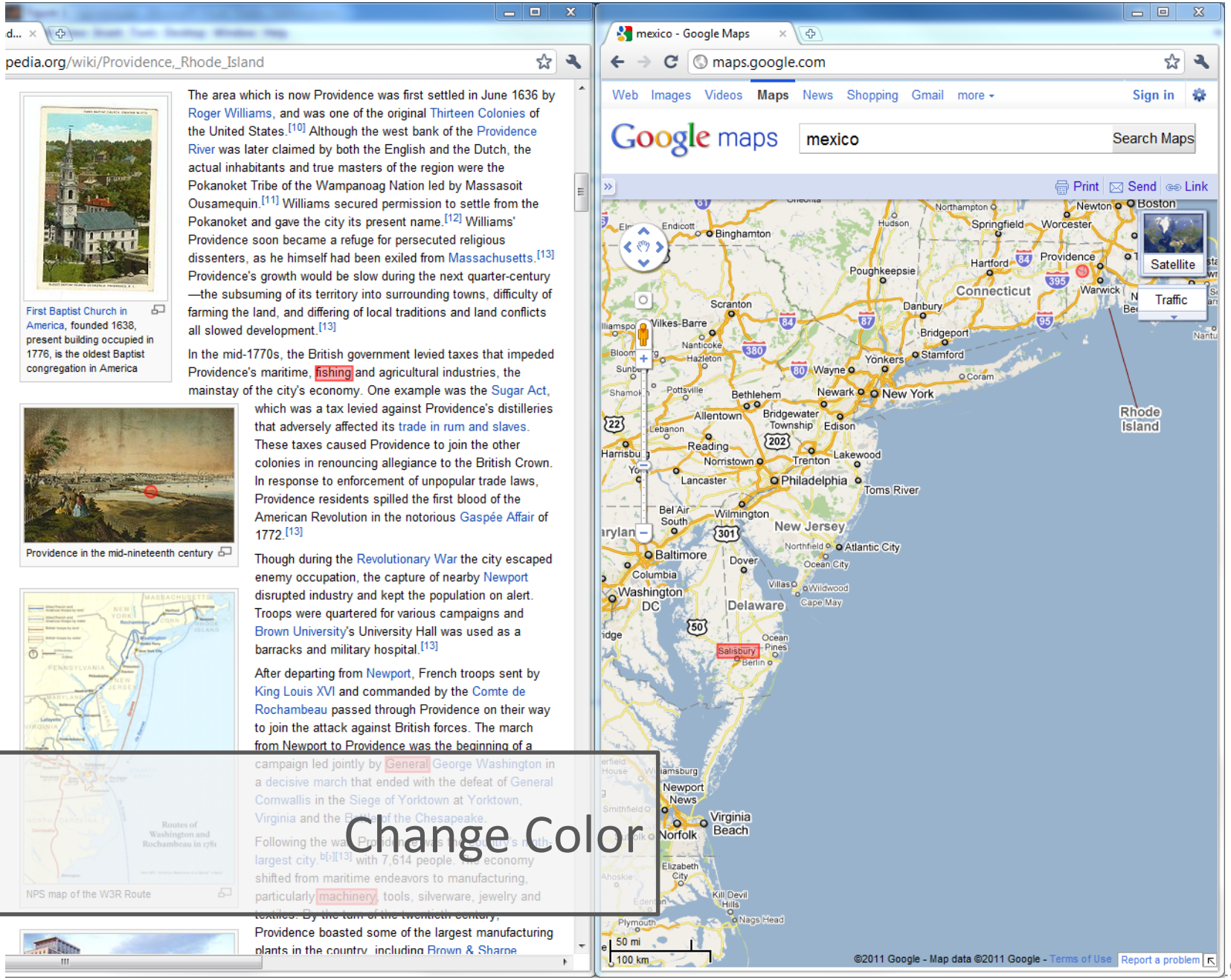


Darken Background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NPS map of the W3R Route
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Search Maps
Print Send Link
Satellite
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Connecticut
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Yonkers
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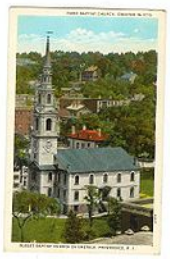

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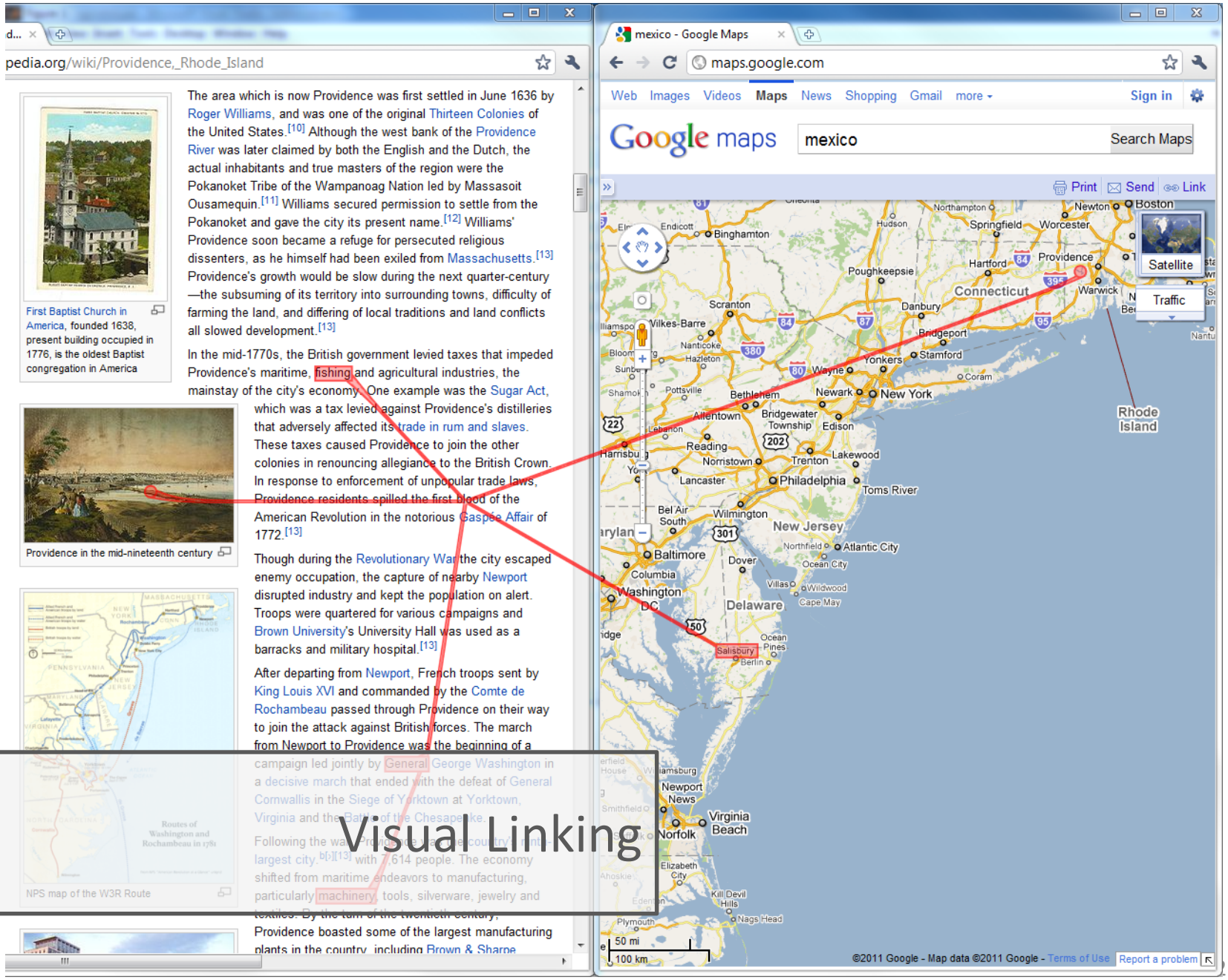
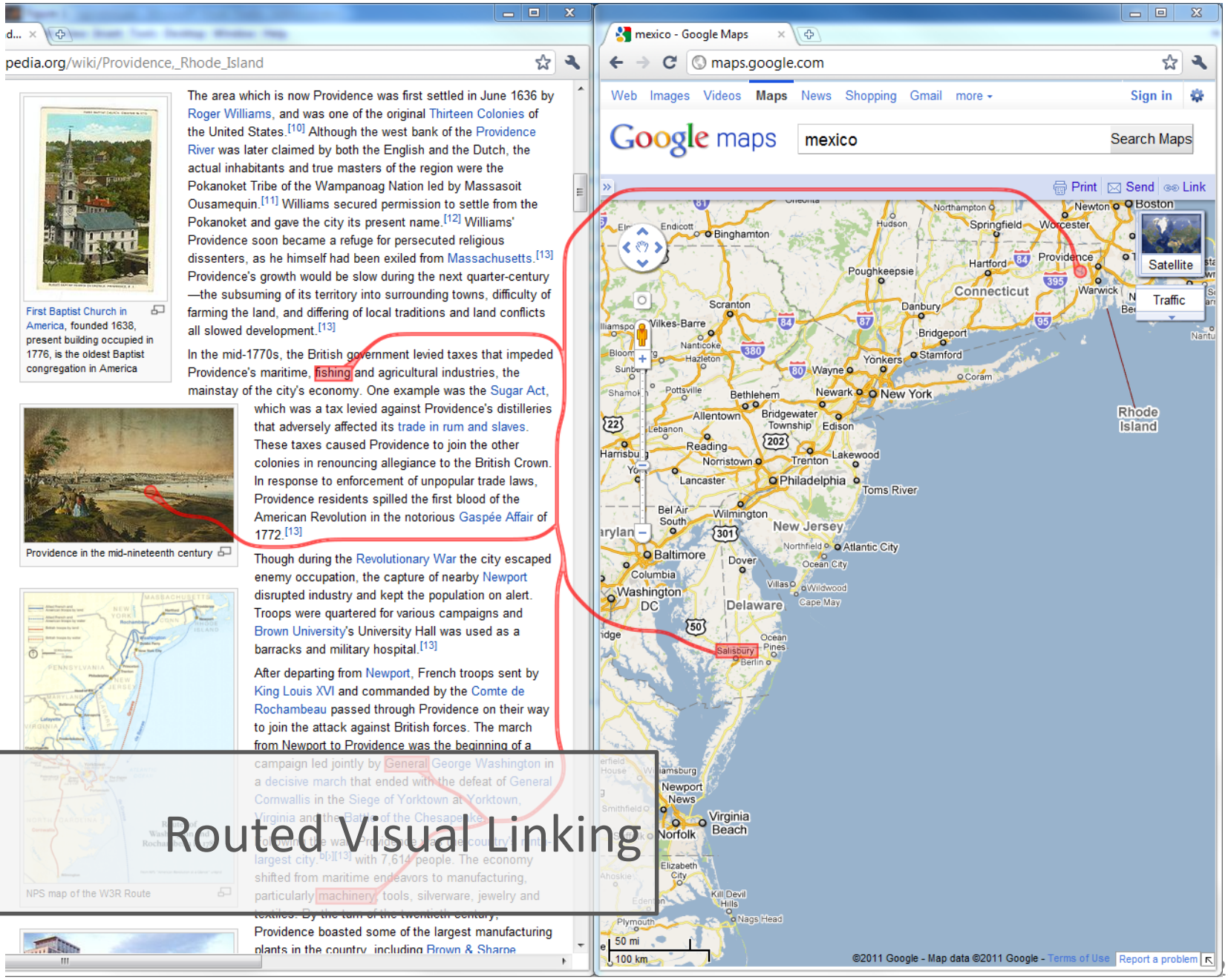


Visual Linking



Routed Visual Linking

Part II: How to Link?

1. Similarity (Gestalt principle, Wertheimer 1923)

2. Proximity (Gestalt principle, Wertheimer 1923)

3. Connectedness (Palmer&Rock 1994)

About Ourselves: Alex Lex

PhD from Graz University of Technology

Post-doctoral Researcher at VCG@Harvard

Research Topics:

- Visualizations with applications in molecular biology
- Visual linking

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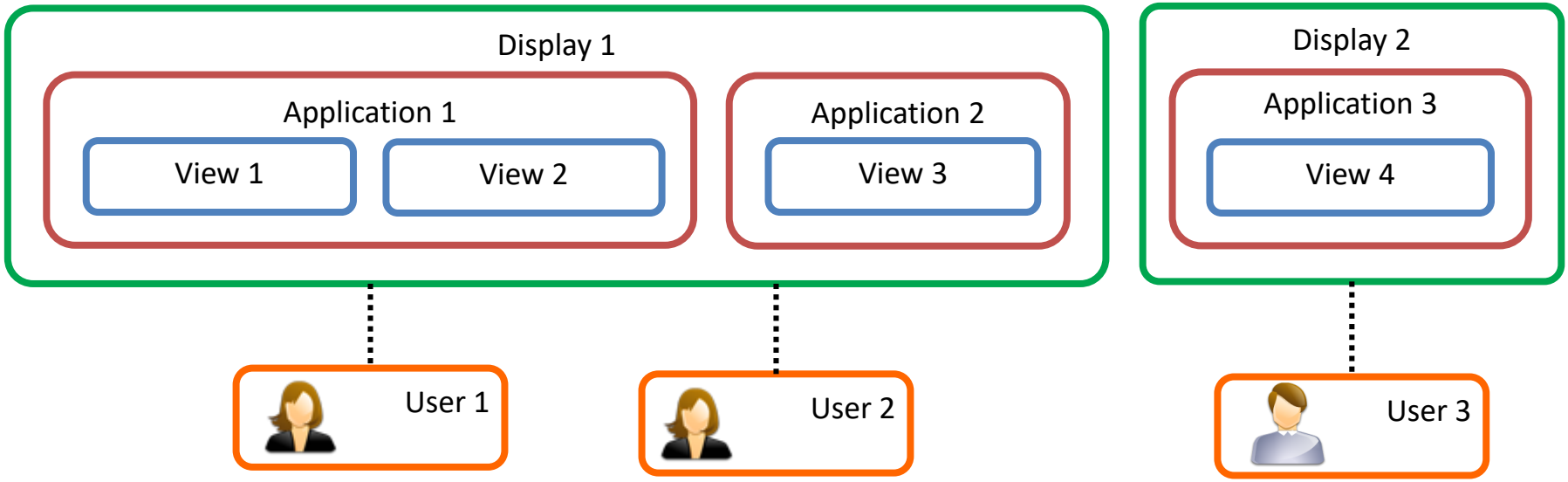

About Ourselves: Marc Streit

PhD from Graz University of Technology

Assistant Professor at Johannes Kepler University Linz

Visiting Researcher at Harvard Medical School

Research Topics:

- Visual Analysis of Heterogeneous Data
  Focus: Biomolecular Data
- Visual Linking
- Caleydo (www.caleydo.org)

Overview

PART 1: What to link?

Relations on Data, View, and Interaction Level

PART 2: How to link?

Representing Relation on View Level

PART 3: When to link?

Application Areas that Benefit from Linking

Schedule

2:15 – 3:15	Part I: What to Link?
3:15 – 3:40	Part II: How to Link?
3:40 – 4:15	Coffe break
4:15 – 4:50	Part II: How to Link?
4:50 – 5:50	Part III: When to link?

WHAT'S YOUR BACKGROUND?

WHAT'S NEXT:
WHAT TO LINK BY HANSI