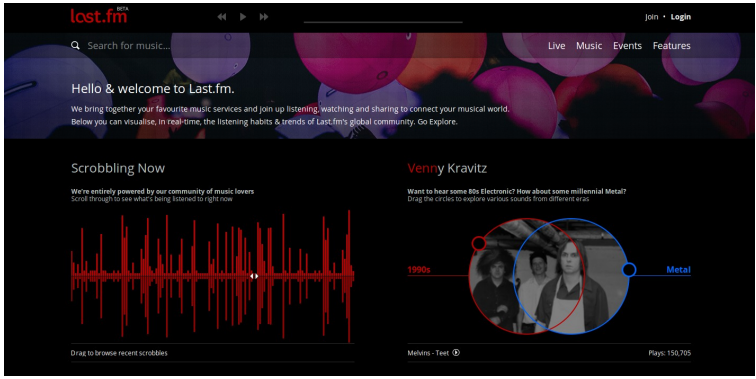
Data Mining A.A. 2015/16

Final projects

List of projects

- Market basket context
  - Individual vs collective purchase behaviours

- Online services
  - Churn analysis on LastFM listenings



- Mobility context
  - Taxi cabs & criminality in San Francisco

Project assignment

- Form groups of 1-3 students
- Send names and project chosen to the instructors
  - Detailed descriptions of the projects will be put online now
  - The datasets will be sent upon receiving your email
- Write a report on the analyses performed and the results obtained and send it before the final exam
  - Final exam will include a presentation with slides
  - 10-15min total for each group/project

Project assignment

- Each project includes
  - A preliminary data exploration phase
  - Data analysis: central phase, driven by the general objectives assigned to you
  - Conclusions, where a summary of the key results, limitations and issues met is provided

Individual vs collective supermarket purchase activity

- General idea: provide the customer a self-awareness of what he does w.r.t. the others

Market basket project
Dataset

- Real data describing customers and transactions
  - Several department stores
  - Purchases performed over 12 months
  - Includes product details, customer ID

- articolo.csv
  - textual description of the products (in Italian)
- cliente.csv
  - basic information about customers (in Italian)
- data.csv
  - translation table for date coding
- marketing.csv
  - marketing hierarchy of products (in Italian)
- venduto.csv
  - transactions, a line for each product sold

Key table

Market basket project

Top 10 most purchased products

- Choose the proper product category level to adopt
  - 70cl Whole Milk Brand X? Whole Milk? Milk?
- Identify an interesting period of day
  - 17-18? Mornings? Thursdays 16-19? Weekends?
- Discover top-10 products in the period for each customer
- Compute purchases distribution on them, for each customer
  - Milk: 50%, Bread: 30%, Wine: 10%, ...

Market basket project

Customer segmentation

- Segment customers into homogeneous groups
- Characterize each group
  - Purchase distributions
  - Other info derived from original data

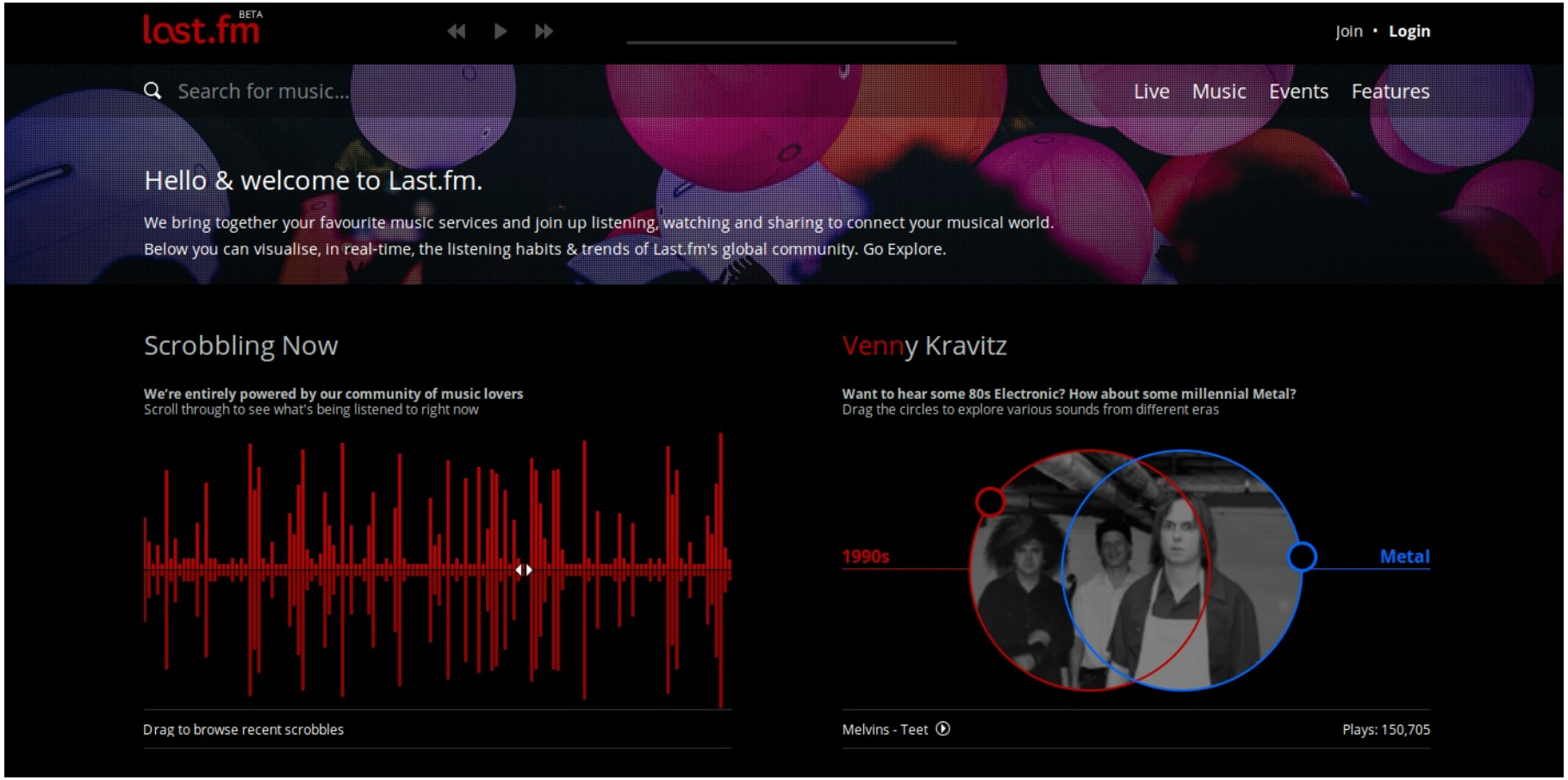
Market basket project

Individual vs. collective

- Select (small) sample of customers
- Compare the customer to the segment he belongs to
  - Highlight similarities and deviations
  - Sketch a self-awareness-style service

LastFM & Churn

- General idea: who and why does stop listening to some music artist or genre?



LastFM & Churn
Data

- Data about listenings: last 200 listening performed by a set a users:
  - user_id: identifies the user
  - date: timestamp of the listening
  - track: title of the song listened
  - artist: artist of the song
  - album: album of the song

LastFM & Churn
Data

- Music genres: association of the predominant / best fitting genre for a given artist, according to LastFM weights:
  - artist: artist/group's name
  - genre: genre of the artist

LastFM & Churn
Data

- Network of friendships of the users:
  - user_id1: user_id contained in listening file
  - user_id2: user which is friend of user_id1

    (Notice: he is not necessarily in listening file)

LastFM & Churn

Churn analysis

- Choose an artist, set of artist or a whole genre
- Study the churn phenomenon for that:
  - Identify the users that consistently listen to them
  - Identify those that, at some point, abandoned the artist/group/genre (churn)
  - Try to understand what determined the churn, and build a model able to predict it in advance.
    - Possible causes to consider: features of the user, of the artist/group/genre, friends' feaures, etc.

LastFM & Churn
Customer segmentation

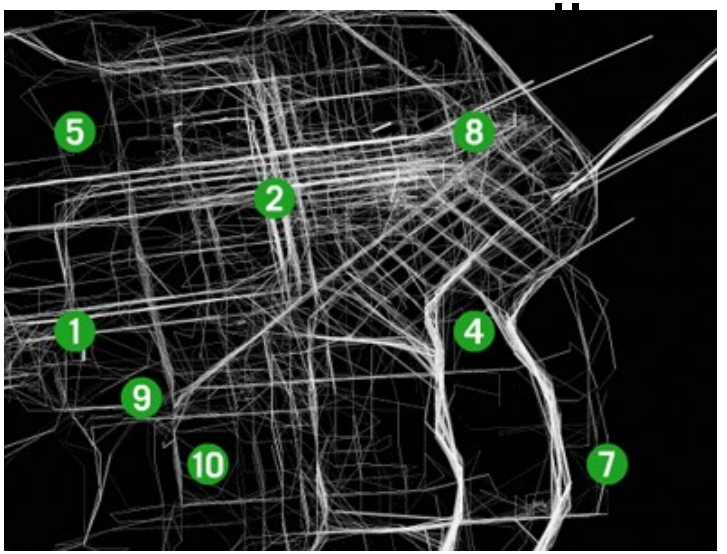
- Build a customer segmentation of LastFM users based on as much information as you can infer:
  - what they listen to
  - when they do that
  - friendships
  - etc.

Taxi cabs & crimes in S.F.

- General idea: does crime influence how taxis operate their service?

Taxi cabs in S.F.
Dataset

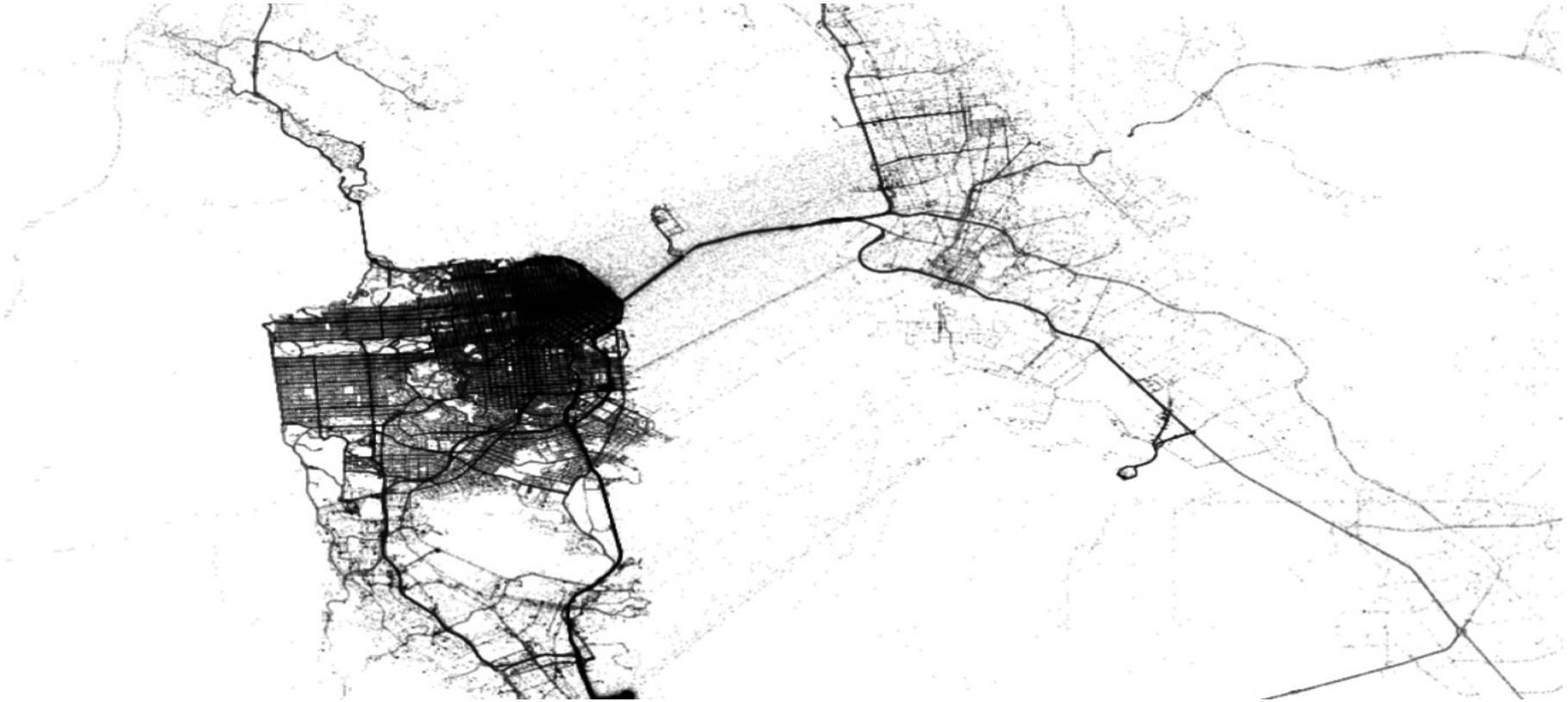
- GPS traces of ~500 taxis over 30 days
- Each San Francisco based Yellow Cab vehicle is currently outfitted with a GPS tracking device
- The data is transmitted from each cab to a central receiving station, and then delivered in real-time to dispatch computers via a central server
- This system broadcasts the cab number, location and whether currently has a fare



Taxi cabs in S.F.
Dataset

- Raw dataset: ~500 files, one per cab:

<Latitude, Longitude, Passenger?, Unix Timestamp>



Crimes in S.F.
Dataset

- Crime event records for S.F. over several years
  - Source: Kaggle data challenge

    https://www.kaggle.com/c/sf-crime
- Incidents derived from SFPD Crime Incident Reporting system.
- The data ranges from 1/1/2003 to 5/13/2015

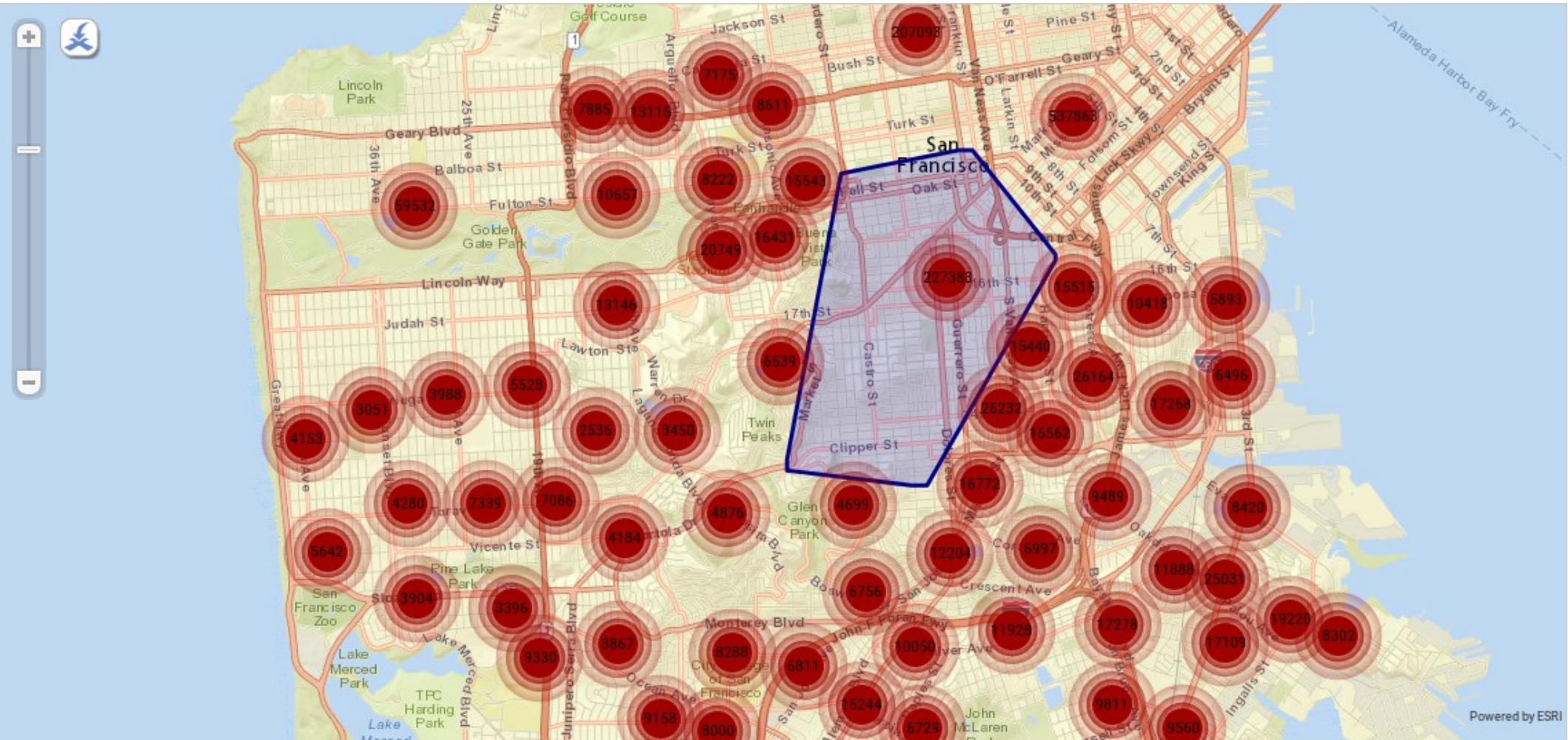
Crimes in S.F.
Dataset

- Data format:
  - **Dates -** timestamp of the crime incident
  - **Category -** category of the crime incident (only in train.csv). This is the target variable you are going to predict.
  - **Description -** detailed description of the crime incident (only in train.csv)
  - **DayOfWeek -** the day of the week
  - **PdDistrict -** name of the Police Department District
  - **Resolution -** how the crime incident was resolved (only in train.csv)
  - **Address -** the approximate street address of the crime incident
  - **X -** Longitude
  - **Y -** Latitude

Crimes in S.F.
Dataset

- Additional data available from

  https://data.sfgov.org/



Taxi cabs & crimes in S.F.
Objectives

- Relation between crimes and the taxi drivers' activity
- Basic questions:
  - Do taxi drivers avoid the areas with highest crime rates when driving?
  - What is the relation between crime rates and number of taxi pick-ups / drop-offs?
    - E.g. do people in high-crime areas prefer taxi to other public transport?
  - Are there specific cases of crimes or crime bursts that apparently affected the taxi activity?
    - globally or in the area of interest of the crimes
  - Any other question you deem interesting.

Questions?