A Comparison of Approaches to Large-Scale Data Analysis

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Aims

The **general aims** of our research project can be summarised in the following points:

1. Track **trends** on the Web by applying Machine Learning methods (track expresses the notions of infer or predict as well)
2. Extend current or invent new **methodologies** (where and if needed) for accomplishing our primary aim
3. Build **tools** that apply the experimental/theoretical results in real and large-scale applications (featured research)

Being more specific

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   - Predict flu rates (*epidemics*)
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   - Feature extraction/selection
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   - Active learning
3. **Applications**?
   - Back-end infrastructure for data collection/retrieval/mining
   - Real time online tools for making and displaying predictions (like the **Flu detector**)

P1 - Summary (1 of 3)

Title: **Tracking the flu pandemic by monitoring the Social Web**
Authors: V. Lampos and N. Cristianini
Submitted to: IAPR Cognitive Information Processing 2010 (accepted)

- Twitter and Health Protection Agency data for weeks 26-49, 2009 (on average 160,000 tweets collected per day geolocated in 54 urban centres in the UK)
- Frequency of **41 flu related words** (markers) in Twitter corpus had a correlation of $>$**80%** with the HPA flu rates in all UK regions
- Learn a better list of weighted markers **automatically**:
  - Generate a list of candidate markers (1560 words taken from flu related web pages)
  - Use **LASSO** for feature selection

P1 - Summary (2 of 3)

Validation schemes:

1. Train on one region, validate regularisation parameter on another, test on the remaining regions (for all possible combinations)

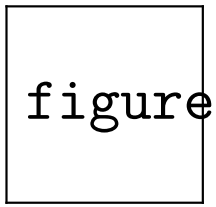
Train/Validate (regions)	A	B	C	D	E
A	-	0.9594	0.9375	0.9348	0.9297
B	0.9455	-	0.9476	0.9267	0.9003
C	0.9154	0.9513	-	0.8188	0.908
D	0.9463	0.9459	0.9424	-	0.9337
E	0.8798	0.9506	0.9455	0.8935	-
				Total Avg.	**0.9256**

97 selected words: lung, unwel, temperatur, like, headach, season, unusu, chronic, child, dai, appetit, stai, symptom, spread, diarrhoea, start, muscl, weaken, immun, feel, liver, plenti, antivir, follow, sore, peopl, nation, small, pandem, pregnant, thermomet, bed, loss, heart, mention, condit, ...

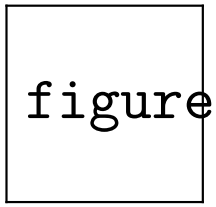
2. Aggregate data from all regions, test on weeks 28 and 41 (2009) and train using the rest of the data set

P1 - Summary (3 of 3)

1. Inferred vs Official flu rate in North England



2. Inferred vs Official rates in all regions (aggregated data set)



P2 - Summary

Title: **Flu detector - Tracking epidemics on Twitter**
Authors: V. Lampos, T. De Bie, and N. Cristianini
Submitted to: ECML PKDD 2010 Demos (under review)

- Extending and making more robust the methodology of P1
- Larger data sets (bigger time series) and more (2675) candidate features
- Select a list of features (markers) using BoLASSO (bootstrap version of LASSO)
- Then learn weights of those markers via linear least squares regression
- Stricter evaluation of the methodology - **Available online**
- Put all this into practice and come up with the **Flu detector**

Other activities

- Studied/implemented the necessary statistical tools and algorithms (in MATLAB or Java)
- Extended further the infrastructure for conducting large scale experiments and data retrieval on demand
- TA for Intro to AI, Data Analysis and Pattern Analysis & Statistical Learning
- Attended some of the ISL meetings and seminars

General goals & activities

1. ... (content omitted)
2. ... (content omitted)
3. ... (content omitted)
4. ... (content omitted)

A more time specific tentative plan

- In **June**: ... (content omitted)
- In **July**: ... (content omitted)
- In **August**: ... (content omitted)
- In **September - November**: ... (content omitted)

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Any questions?