Introduction to Data Science - 1MS041

Benny Avelin

Department of Mathematics

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Base outline

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2. 7.5hp Final exam in January

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Specifics

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2. The groups are free to form in the size-range 3-5 ppl.
3. Individual contribution is mandatory.
4. To pass you need to have completed all 3 group assignments.

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2. We have 4 computer based individual assignments which are automatically graded, each consists of 24p.

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2. We have 4 computer based individual assignments which are automatically graded, each consists of 24p.
3. These give bonus points for the final exam.
4. The bonus for the main exam is the score for the individual assignment / 16. So if you get full score, i.e. 96p then you have a bonus of 6p on the final exam (a pretty good bonus).

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3. For the group assignments, you are free to form your own groups. This should preferably be done before the end of the problem session on Thursday next week. Rules etc. can be found on the course website. Aim for 5 people in each group.

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2. We will be mixing theoretical and practical during each lecture / problem session.
3. At the end of this course, you will be able to solve a few typical problems. But more importantly, you will have learned the language of probability which will allow you to understand other problems.

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4. Unsupervised learning
   - 4.1 Dimensionality reduction
   - 4.2 Some anomaly detection

Model problem: SMS spam filtering

You would like to filter your SMS (or similar instant messaging) texts as "Spam" or not. Consider the following examples

1. *Free entry in 2 a wkly comp to win FA Cup final tkts 21st May 2005. Text FA to 87121 to receive entry question(std txt rate)T&C's apply 08452810075over18's*
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What about the following?

1. *Thanks for your subscription to Ringtone UK your mobile will be charged 5/month Please confirm by replying YES or NO. If you reply NO you will not be charged*

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What you will learn

1. What do we actually mean when we ask these questions. (Probability)
2. How to process data and actually solve them using the computer. (ETL)
3. How to test the found solution with guarantees. (Concentration)

Corporate travel (Markov chains)

Consider having access to source-destination of multiple business flight travelers.

User	Source	Destination
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3. What is the probability that a user starting in Recife will get back to Recife within 4 steps?

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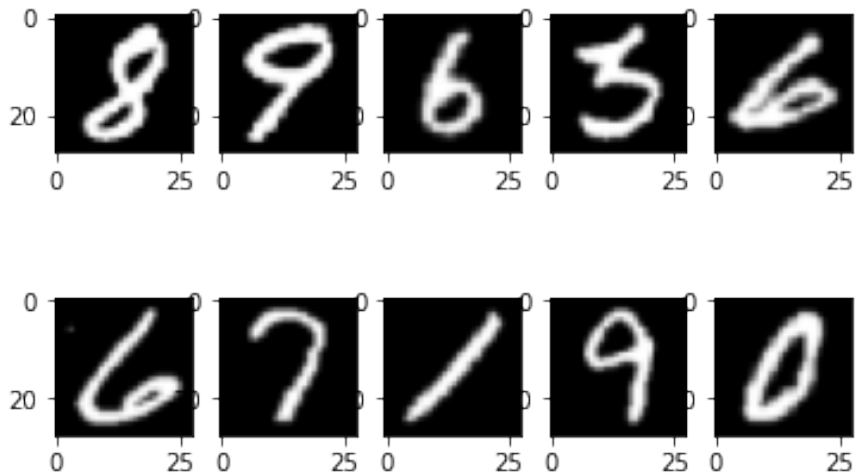
2. What is the average cost going from Aracaju to Recife?
3. What is the probability that a user starting in Recife will get back to Recife within 4 steps?
4. Can we simulate our own flights?

Anomaly detection

- Anomaly detection, is a method one uses to distinguish something out of the ordinary. Usually this begins by us having a way to represent what is normal, and then check when something cannot be well represented anymore.
- This is used everywhere, from credit card fraud to predictive maintenance.

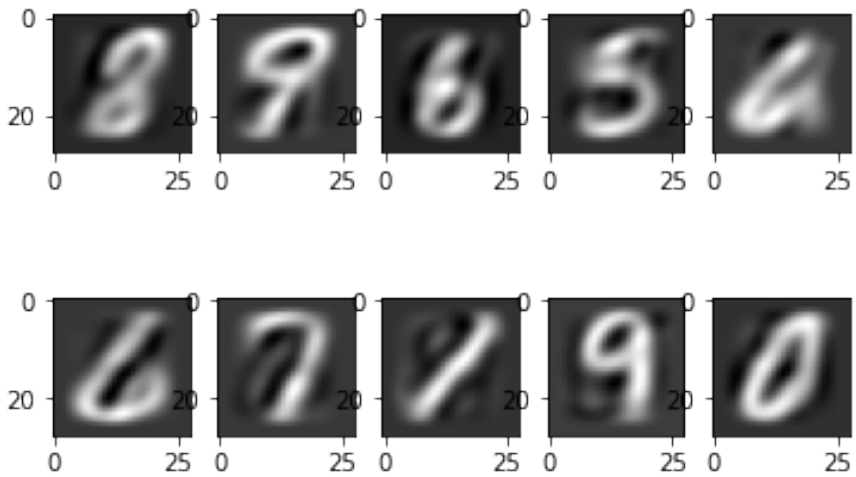
Dimensionality reduction for anomaly detection

Consider the following images of handwritten digits:



Can we represent these with less data?

Here I have used a technique called SVD to represent the images



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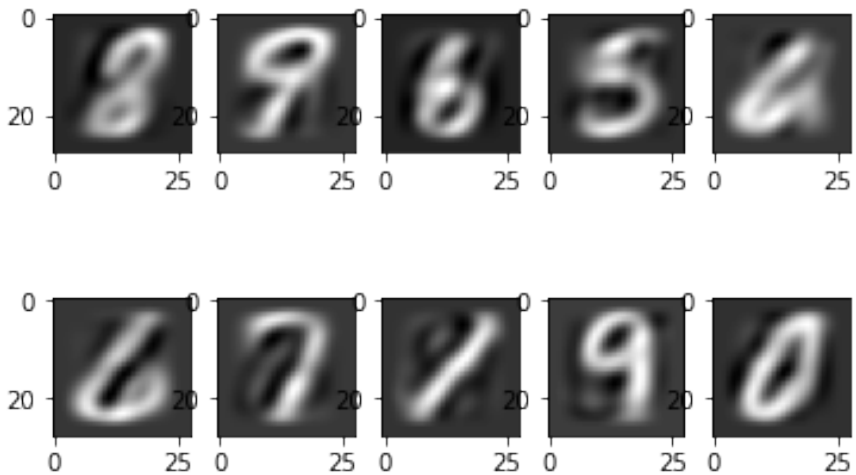

But watch what happens when I supply something else