LTAT.06.010 Pervasive Data Science

Lecture 1

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DISTRIBUTED AND PERVASIVE SYSTEMS

Tartu, Estonia 05/09/2022
Overview

• Pass/Fail course
• Lectures will be in person (unless agreed otherwise)
Overview

Goal: To obtain a general idea of pervasive data science by developing a topic of your interest. The topic will be developed incrementally throughout the course. Thus, there will be intermediate presentations and checking points.

Result: After taking this course, you will have acquired new skills for data sampling and data analysis.

Deliverables: It depends on the project chosen. The deliverable can be a user study, a review or a Jupiter notebook. This is agreed with the lecturer during the seminar.
Research

Distributed systems
Research

Mobile and pervasive systems
Research agenda

Distributed Systems

Mobile and Pervasive computing

Our expertise

Examples

Drink (liquid) identification

Energy management

Health indicators
More examples

Energy management

Psychology

Liquid recognition

Material identification

Drones for air quality
Example 1:
Aquatic plastic pollution

Objective: To identify plastics underwater.

Source: https://www.pinterest.com/pin/484840716132563124/
Example 1: Aquatic plastic pollution

Objective: To identify plastics underwater.

<table>
<thead>
<tr>
<th>Test</th>
<th>k-NN</th>
<th>Random forest</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross Validation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All conditions 6-folds</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
</tr>
<tr>
<td>Ambient 6-folds</td>
<td>0.96</td>
<td>0.95</td>
<td>0.96</td>
</tr>
<tr>
<td>Darkness 6-folds</td>
<td>0.94</td>
<td>0.96</td>
<td>0.95</td>
</tr>
<tr>
<td>Model data → Predicted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient → All conditions</td>
<td>0.80</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>Ambient → Darkness</td>
<td>0.69</td>
<td>0.68</td>
<td>0.69</td>
</tr>
<tr>
<td>Darkness → All conditions</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
</tr>
<tr>
<td>Darkness → Ambient</td>
<td>0.94</td>
<td>0.92</td>
<td>0.93</td>
</tr>
<tr>
<td>Average</td>
<td>89.0</td>
<td>88.7</td>
<td>88.9</td>
</tr>
</tbody>
</table>
Example 2: Monetary perception of battery life

Objective: To understand the value that individuals put the battery life of their devices

= how much?

= how much?

Example 2: Monetary perception of battery life

Objective: To understand the value that individuals put the battery life of their devices

PROJECTS
Project 1:

Objective: A taxonomy of measuring and sensing productivity

[source] https://www.magpierecruitment.com/blog/2021/04/productivity?source=google.com
Project 2:

Objective: Understanding typing patterns of users on mobile screens through typing sound
Project 3:

**Objective:** Review Explainability methods for Artificial Intelligence (AI is black-box)
Project 4:

Objective: Characterizing Drinks through WiFi analysis
Objective: Perception of users towards autonomous vehicles invading public spaces
Project 6:

Objective: Implement a data poisoning attack for Federated Learning.
Project 7:

Objective: Design a blueprint architecture that can be used to audit web applications using XAI methods.
Project 8:

**Objective:** Review about why digital contact tracing failed in pandemic times

Source: https://www.cochrane.org/news/featured-review-digital-contact-tracing-technologies-epidemics-rapid-review
Project 9:

Objective: Identifying and counting people around autonomous ground vehicles
**Project 10:**

**Objective:** Nutritional value of fruits and vegetables

<table>
<thead>
<tr>
<th>Within first 5 days (stage 1)</th>
<th>Between 5 to 10 days (stage 2)</th>
<th>After 10 days (stage 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5</td>
<td>6 7 8 9 10</td>
<td>11 12 13 14 15 16</td>
</tr>
<tr>
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<td>6 7 8 9 10</td>
<td>11 12 13 14 15 16</td>
</tr>
<tr>
<td>1 2 3 4 5</td>
<td>6 7 8 9 10</td>
<td>11 12 13 14 15 16</td>
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</table>
Take away

- Choose a topic
- Send me the topic title via Slack Message Board (Accessible from the course webpage)
Next lecture

Lecture 2: Revisiting available and new projects
Questions?

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