LTAT.06.010 Pervasive Data Science

Lecture 1

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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 analysis of sensor data.

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

Mobile and pervasive systems
Research agenda

We focus on solving **real world problems** with **cutting-edge research**.

Our topic for projects:
- Distributed Systems
- Drones
- Sensors
- Smart devices
- Networks (5G, LTE, Wireless)
- Data science
- Wearables
- IoT

Mobile and Pervasive computing
Examples of pervasive science

- 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>0.95</td>
<td>0.95</td>
<td>0.95</td>
</tr>
<tr>
<td>All conditions 6-folds</td>
<td>0.96</td>
<td>0.95</td>
<td>0.96</td>
</tr>
<tr>
<td>Ambient 6-folds</td>
<td>0.94</td>
<td>0.96</td>
<td>0.95</td>
</tr>
<tr>
<td>Darkness 6-folds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model data → Predicted</td>
<td>0.80</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>Ambient → All conditions</td>
<td>0.69</td>
<td>0.68</td>
<td>0.69</td>
</tr>
<tr>
<td>Ambient → Darkness</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
</tr>
<tr>
<td>Darkness → All conditions</td>
<td>0.94</td>
<td>0.92</td>
<td>0.93</td>
</tr>
<tr>
<td>Darkness → Ambient</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>89.0</td>
<td>88.7</td>
<td>88.9</td>
</tr>
</tbody>
</table>

Testbed for plastic recognition underwater
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: Understanding handgrip strength of humans using light sensors
Project 2:

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

Objective: A taxonomy of distributed and machine learning
Project 4:

Objective: Explainability of deep learning models using performance metrics
Project 5:

Objective: Perception of users towards autonomous vehicles invading public spaces
Project 6:

Objective: Detecting micro-plastics with thermal imaging and light reflectivity
Project 7:

Objective: Estimating energy consumption of applications using thermal imaging
Project 8:

Objective: A taxonomy of digital contact tracing

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

Objective: User perception of litter classification using sensors

Source: https://www.vectorstock.com/royalty-free-vector/waste-recycling-concept-vector-31773935
Project 10:

Objective: Nutritional value of fruits and vegetables
Take away

- Choose a topic
- Send me the topic title via e-mail
Next lecture
Lecture 2: Revisiting available projects
Questions?

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