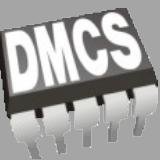




Interactive Web Applications



1. Introduction – who am I?
2. Introduction – who are you?
3. Introduction – basic rules
4. Goal
5. Learning outcomes
6. Course organisation
7. Ethical and technical issues
8. Toolbox
9. Questions and answers

1


Introduction


Who am I?

Employee's Details



dr inż. Rafał Kotas

 rkotas@dmcs.pl

 +48 42 631 27 25



14.10.2014 Doctor of Philosophy Degree in Engineering,

Lodz University of Technology

the discipline of Electronics

the dissertation title: “Development of the objective method for detection and analysis of disorders in the olfactory evoked potentials”,

The Faculty of Electrical, Electronic, Computer and Control Engineering

Lodz University of Technology, Poland (Resolution No. 1/2014/2015)

2009 – 2014 PhD studies in Electronics

Lodz University of Technology

Biomedical signal processing (ECG, EEG signal processing)

2011 – 2012 Postgraduate studies: Web applications designing based on Java and Oracle platforms

Lodz University of Technology

Web applications designing based on Java and Oracle platforms (Spring, Hibernate, JBoss Seam)

2004 – 2009 MSc in Electronics

Lodz University of Technology

the specialization of Industrial Electronics

the dissertation title: “Virtual glove controlled by a microprocessor system”

Experience:

- Java EE (JSF, Spring, Hibernate, WildFly, Struts2, Grails, Play, Liferay), VB, C/C++, C# JavaScript/TypeScript (AngularJs, Angular, Vue.js, React)
- database design (PostgreSQL, MySQL, Oracle DB, MongoDB)
- methods of artificial intelligence: artificial neural networks, support vector machines, decision trees, Bayesian networks, decision networks, Markov models, natural language processing
- software management/supporting tools: JIRA, Redmine, Bugzilla, Ant, Maven, GIT, SVN, UML/SYSML modelling, Enterprise Architect
- electronics design: Altium Designer, PSpice
- embedded/microprocessor systems – design and programming
- control and data acquisition systems, SCADA, EPICS, PLC programming
- the field of acquisition, processing and analysis of bioelectric signals for the purpose of medical diagnosis (ECG, EEG, EMG), balance disorders, sleep deprivation
- high energy physics

Participation in research projects:

- “The Proton Improvement Plan-II” at Fermilab complex in Chicago USA, 2023-now
- "Personalized Protective Thermally Active Clothing", The National Centre for Research and Development project, 2018-2023, commercialisation
- "Innovative system for evaluation and rehabilitation of human imbalance", The National Centre for Research and Development project, 2016-2020
- “Natural Language Processing for PSA navigation system” – PSA (Peugeot-Citroen), Cooperation in the area of personalized car, 2015-2016
- "Online support system for the identification and treatment of speech defects in children of preschool age." - The National Centre for Research and Development - Social Innovations Program 2015-2016
- "The ARUZ Analyzer of Real Complex Systems" - Technopark Łódź, Polish Agency for Enterprise Development 2015
- "The use of the latest generation of BNDCC and DDCC composites for cutting tool", PBS1/A5/7/2012, The National Centre for Research and Development project – control and data acquisition systems developer for pulse plasma sintering technique, 2012-2013
- "Sudden Cardiac Death risk stratification based on functional assessment of autonomic nervous system with the use of Holter methods", UMO-2011/03/B/ST6/03454, The National Centre for Research and Development project, 2012-2013
- “Automated multiparameter system for assessment of the patient’s general condition with comprehensive analysis of the respiratory and circulatory functions”, UMO-2011/01/B/ST6/04726, The National Science Centre project, 2010-2011

Ways of contact:

1. MS Teams message
2. Email:
rafal.kotas@p.lodz.pl
rkotas@dmcs.pl
3. MS Teams online meeting
4. Office hours meeting

Information for students

Proszę o wcześniejsze mailowe potwierdzenie swojej obecności na wybranych godzinach konsultacji!!! / Email confirmation of selected office hours is expected!!!

2

Introduction

Who are you?

Do you have any experience in (apart from regular course subjects of Computer Science at Lodz University of Technology):

- web applications – which technologies?
- Java
- database (SQL, noSQL)
- JavaScript/TypeScript
- HTML
- CSS

3

Introduction

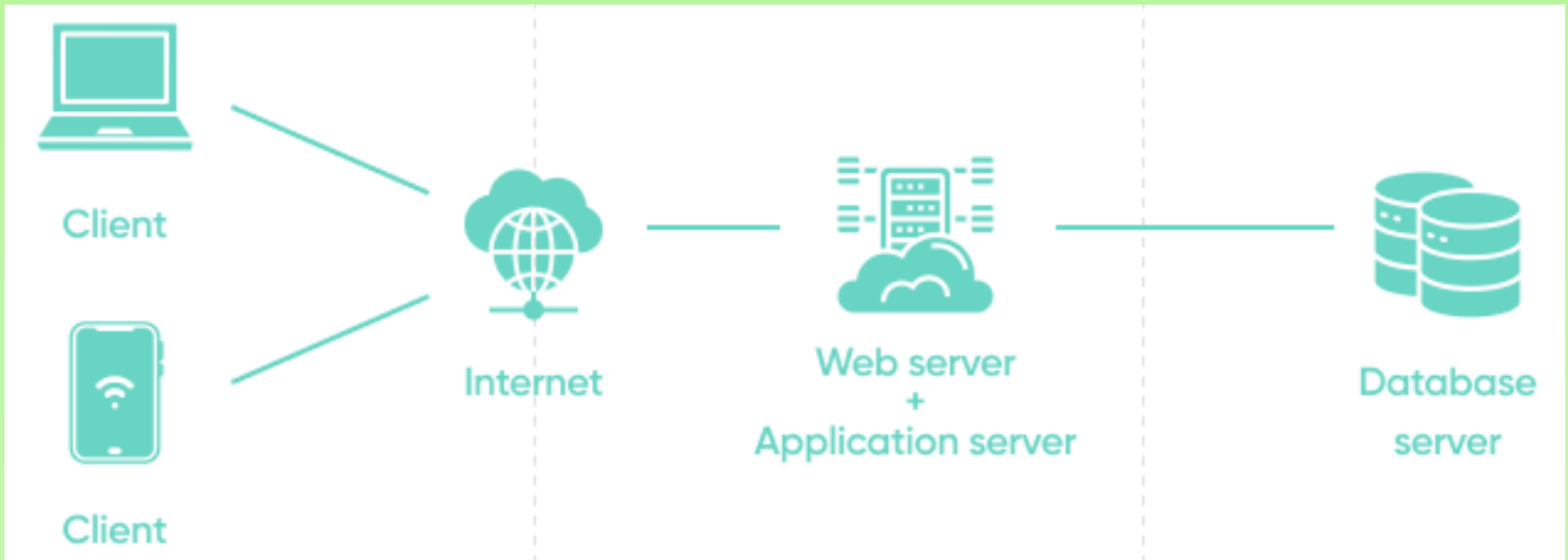
Basic rules



4

Goal

The goal of the subject is to show (teach*) a student the basics of modern, client – server based, web applications development with the usage of REST technology. During the course student becomes familiar with the newest technologies for developing rich client interface (frontend) Angular as well as server side of an application (backend) Spring Boot and database engine PostgreSQL.



All of the layers will be served locally on a single computer.

5

Learning outcomes

Student:

1. knows the basics of web application, client - server architecture design.
2. is able to configure server side of web application with the use of Spring Boot.
3. is able to build a client-side of an application with the usage of HTML and CSS and simple functions in JavaScript/TypeScript language.
4. can create web application with REST technology.
5. can build a rich client – side of an application with Angular.
6. knows how to debug and test web application.

ID	Task Name	2026-03					2026-04					2026-05					2026-06			
		01	08	15	22	29	05	12	19	26	03	10	17	24	31	07	14	21		
1	Interactive Web Applications																			
2	Lecture																			
3	Laboratory Tasks																			
4	Laboratory Project																			

6

Course organisation

LECTURE

The first part of the lecture covers the basics of client – server web applications architecture design.

Spring Boot technology is briefly presented, on a level which allows developing server side of a web application with the usage of REST technology and JSON format.

The next part of the lecture covers principles for developing rich client – side of a web application in JavaScript (TypeScript) and Angular framework.

The last part of the lecture covers security mechanism implemented in web applications based on JSON Web Token (JWT).

ID	Task Name	2026-03					2026-04					2026-05					2026-06			
		01	08	15	22	29	05	12	19	26	03	10	17	24	31	07	14	21		
1	Interactive Web Applications																			
2	Lecture																			
3	Laboratory Tasks																			
4	Laboratory Project																			

6

Course organisation

LABORATORY

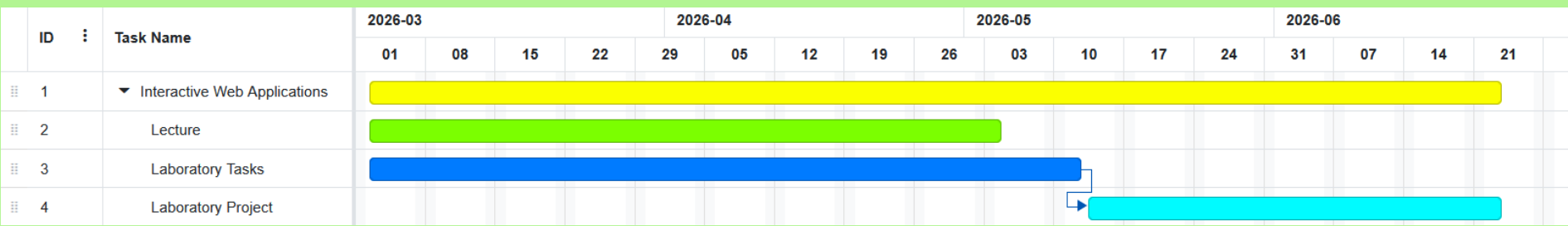
The first part of the laboratory is a set of exercises that have to be completed – details in *iwa_exercises.pdf*.

The second part of the laboratory is a small project summarizing the acquired knowledge – details in *iwa_requirements.pdf*.

MATERIALS

WIKAMP platform (Interactive Web Applications 2025/2026)

Students self enrolment: iwa2026



6

Course organisation

EVALUATION

It is a conversation based project presentation and Q&A part:

- 1) Live demo of your web application.
- 2) Questions related to the project and code.
- 3) Questions related to general topics covered by the lecture and project.

7

Ethical and technical issues

Yes, but....


```
import numpy as np

class DecisionNode:
    def __init__(self, feature):
        # Function input: sample. Output: index of child node
        self.function = lambda x: x[feature] == 1
        self.print_f = "\t[" + str(feature + 1) + "] == 1"
        self.children = [None, None]
        self.accuracy = 0

    # Given an input, calculates which child node to return
    def evaluate(self, input):
        return self.children[self.function(input)]

class DecisionTree:
    def __init__(self, max_depth):
        self.root = None
        self.max_depth = max_depth

import numpy as np

class DecisionNode:
    def __init__(self, feat):
        # Func input: sample. Output: index of child node
        self.func = lambda x: x[feat] == 1
        self.print_f = "\t[" + str(feat + 1) + "] == 1"
        self.children = [None, None]
        self.acc = 0

    # Given an input, calculates which child node to return
    def evaluate(self, input):
        return self.children[self.func(input)]

class DecisionTree:
    def __init__(self, max_d):
        self.root = None
        self.max_d = max_d
```

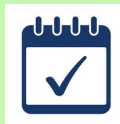
Can you use/copy your colleagues source code?



Can you use any of the artificial intelligence tools for code generation?



Can you use your private computers/laptops?



Is presence obligatory?



Can you swap between laboratory groups?

- Java 25 (> 17)
- IntelliJ IDEA 2025.3.3 (Ultimate Edition)
- Node.js 24.13.0
- npm 11.11.0
- Angular CLI 21.2.0
- PostgreSQL 18
- Postman
- Git
- WIKAMP

9

Questions and answers





THE END

