



ITMO UNIVERSITY

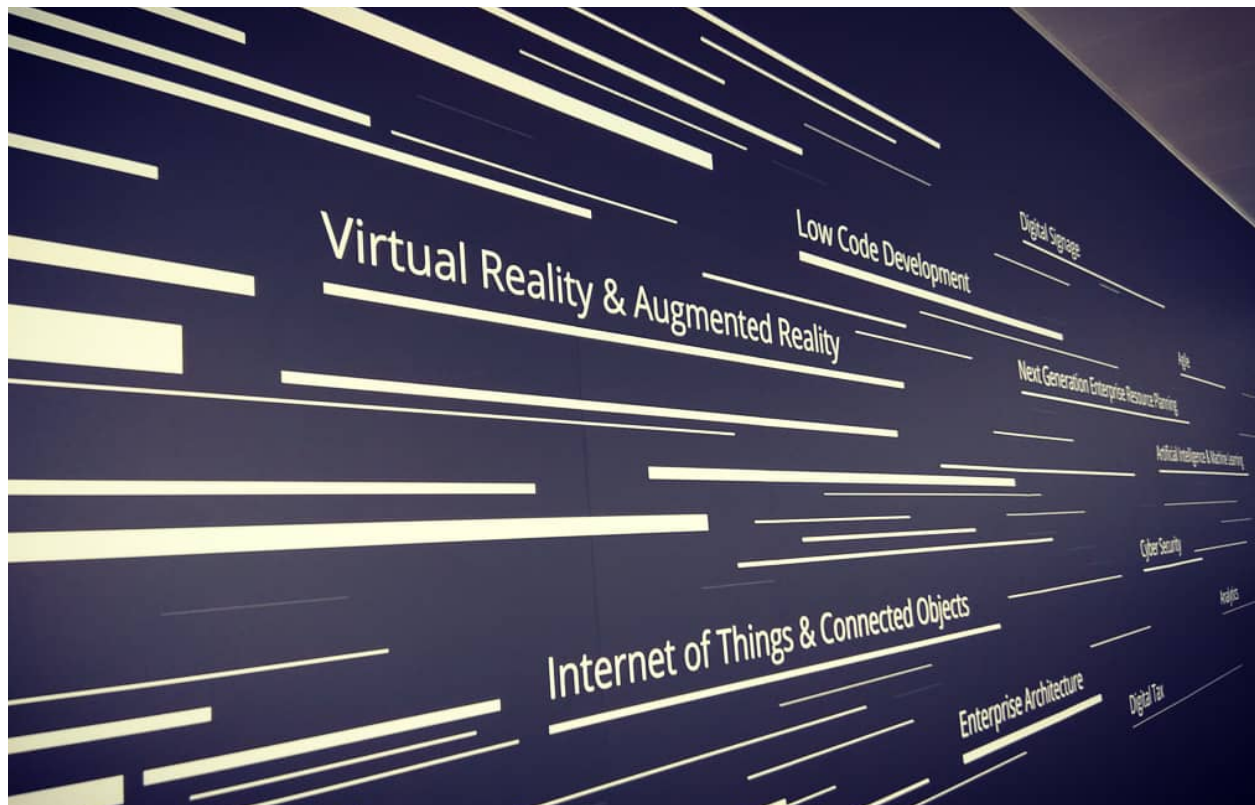
Saint Petersburg, Russia

Existing Teaching Practices in the Field of AR

Analytical report

Presentation outline

- ✓ Purpose of the survey
- ✓ Methodology
- ✓ Results of the analysis



Purpose of the survey

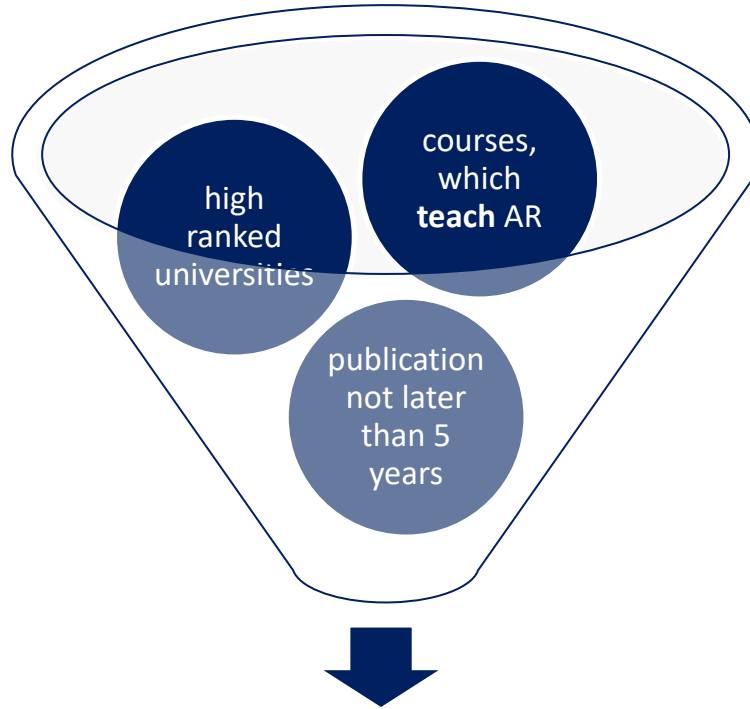
- ✓ To identify and survey universities and those known to have AR and related topics in their study programs.
- ✓ To look at how AR teaching is performed in universities.

Methodology

- ✓ Planning the analysis
- ✓ Identifying educational programs
- ✓ Extracting data
- ✓ Reporting findings

Planning the analysis

Key words:
augmented reality,
education,
courses.



Inclusion criteria

Extracting data

Table 1. Search results by online databases

Source	Search Strings		Total
	Virtual Reality	Augmented Reality	
www.mastersportal.eu	148	59	206
www.findamasters.com	112	40	152
www.bachelorsportal.com	170	47	217

www.mastersportal.eu,
www.findamasters.com,
www.bachelorsportal.com,
websites of leading universities

Data coding and analysis process

- ✓ academic level;
- ✓ number of credits;
- ✓ prerequisites;
- ✓ objectives;
- ✓ learning outcomes;
- ✓ teaching methodology;
- ✓ assessment criteria.

■ USA ■ UK ■ other countries

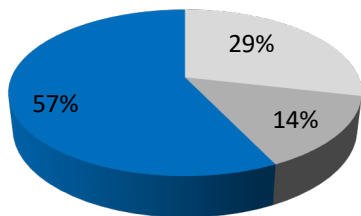


Figure 1 – Countries distribution

#	HEI* organisation	Country of Origin	QS#	THE #	ARWU #
1	Aalto University	Finland	101-150	99 (190)	401-500
2	TU Wien	Austria	51-100	126-150	101-150
3	TU of Munich	Germany	64	41	50
4	Trinity College Dublin	Ireland	88	117	151-200
5	University of Cambridge	UK	5	2	3
6	NUS	Singapore	15	22	91
7	City University of Hong Kong	China	49	119	201-300
8	KTH	Sweden	98	173	201-300
9	Carnegie Mellon University	USA	47	24	80
10	Cornell University	USA	16	19	13
11	Johns Hopkins University	USA	17	17	16
12	University of California Berkeley	USA	27	18	
13	University of Bradford	UK	601-650	601-800	-
14	Tilburg University	Netherlands	357	195	
15	Columbia University	USA	18	14	8

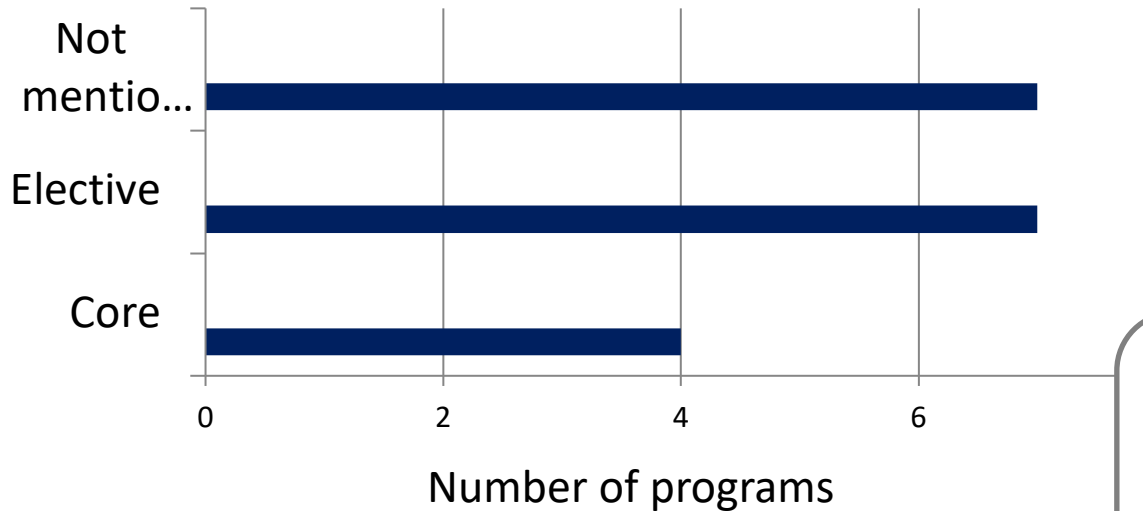
Course Titles

- ✓ Virtual and Augmented Reality
- ✓ Medical Augmented Reality
- ✓ Image Processing and Augmented Reality
- ✓ 3D User Interfaces and Augmented Reality
- ✓ Interaction Design for Virtual and Augmented Reality

Subject area of AR programs

#	Subject area	Number of programs
1	Communication and New Media/Creative Media/ Media Technology/ Multimedia Design/ Visual Computing / Computer Graphics	6
2	Computational Science/ Information Systems/ Information Technology/Computer Science/	4
3	Game Design/Engineering	2
4	Biomedicine/Health Informatics	2
5	Virtual and Augmented Reality	2
6	Interactive Entertainment	1
7	Artificial Intelligence	1

Core or Elective?



Core: more specific
MSc in Visual Computing
MSc in Game Engineering
Elective:
Master of Computer Science
BSc In Computer Science

Prerequisites

Necessary:

- ✓ Basic mathematical and programming skills
- ✓ Linear algebra
- ✓ Fundamental of algorithms
- ✓ Fundamental structures

Would be helpful but not necessary:

- ✓ Knowledge of 3D computer graphics
- ✓ User interaction
- ✓ Fundamentals of computer vision

Essential characteristic of educational program or educational course as they help a lecturer to teach in a certain academic level and to student to feel more comfortable and confident with the course

Exceptions:

- ✓ Strong programming experience (JavaScript, C or C++)

Virtual reality by University of Stanford

Meeting curriculum objectives and skill development

“This course will cover fundamentals and state-of-the-art in AR, as well as related areas of 3D computer vision and graphics”.

- Augmented Reality, Trinity College Dublin

“The course aims to provide fundamental knowledge in digital image processing and its applications in pixel based computer graphics”.

-Image Processing and AR, City University of Hong Kong

“In this course you will learn both technological and human aspects of VR and AR, including visual and auditory displays, psychophysiology of senses, user tracking and other input techniques, and building practical applications”.

- Virtual and Augmented reality, Aalto University

Meeting curriculum objectives and skill development

“This course introduces students to the field of AR. It then focuses on Medical AR and its particular requirements”

- Augmented Reality, Johns Hopkins Whiting school and engineering.

“The objectives of this lecture are to have students learn the theoretical basics and practical aspects of AR solutions related to the medical field”

Augmented Reality, TU of Munich

Learning outcomes

- ✓ “Learning outcomes are sets of competences, expressing what the student will know, understand or be able to do after completion of a process of learning, long or short.” (European Commission, 2004).
- ✓ They focus on what the student has achieved rather than merely focusing on the content of what has been taught (Kennedy, 2007).

Learning outcomes

Professional

AR/VR software and hardware

Input and Output devices

Mathematical and programming aspects of AR systems

Cognitive and practical

Critical thinking

Conducting own research

Entrepreneurial culture

Soft Skills, innovation competence and creativity

Ability to work as a team

Project management

Self-organisation, self-initiative, self-responsibility

Through mentored project, students will create and build a plan to enter AR market

Create their own project and complete all stages of project lifecycle

Example of learning outcomes

Professional knowledge

Basic knowledge of tracking technologies

Basic knowledge of display technologies

Distributed VR/AR systems

Tracking, stereo rendering techniques, distributed graphics

Cognitive and practical skills:

Developing collaborative and distributed VR/AR applications with 3D input and output devices.

Understanding current research and publications in this field.

Conducting own research projects in this area

Social skills, innovation competence and creativity

Increasing the individual creativity and innovation potential

Self-organization, self-initiative and self-responsibility

Teamwork and responsibility in complex projects

Communication and criticism

Impact assessment and ethical evaluation

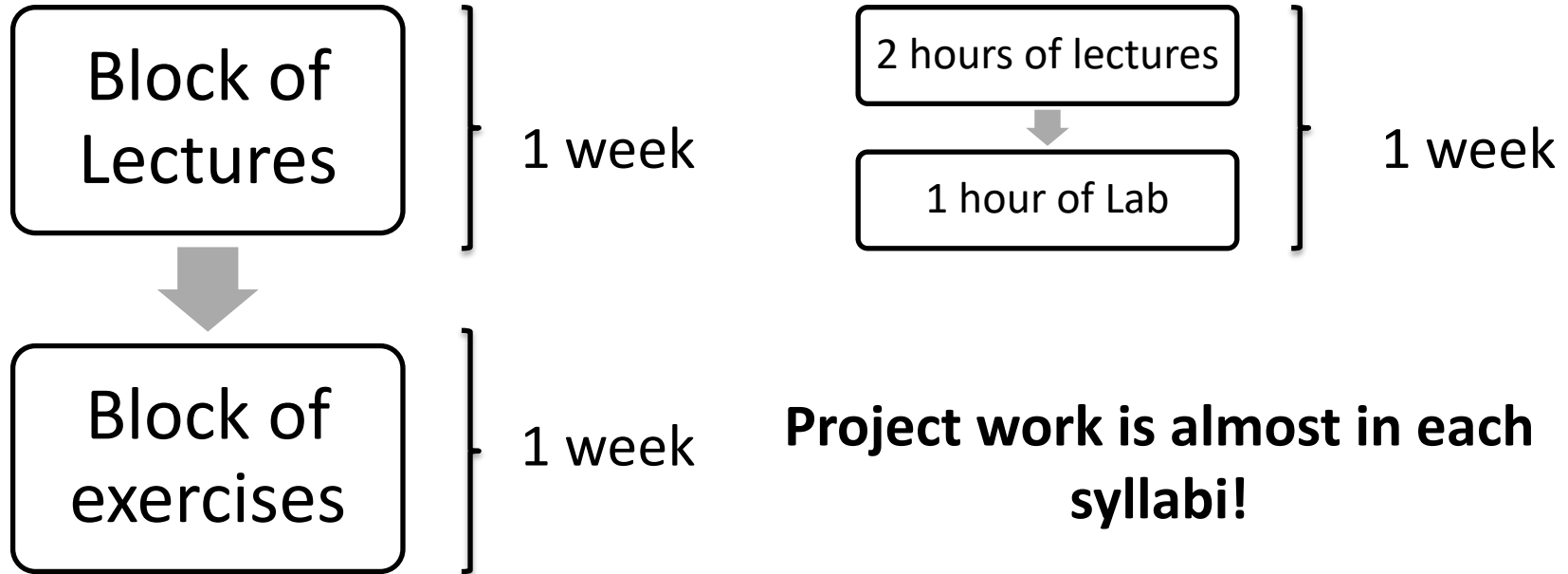
Virtual Reality and
Augmented Reality
TU Wien

Teaching methodology:

mixture of different teaching methods

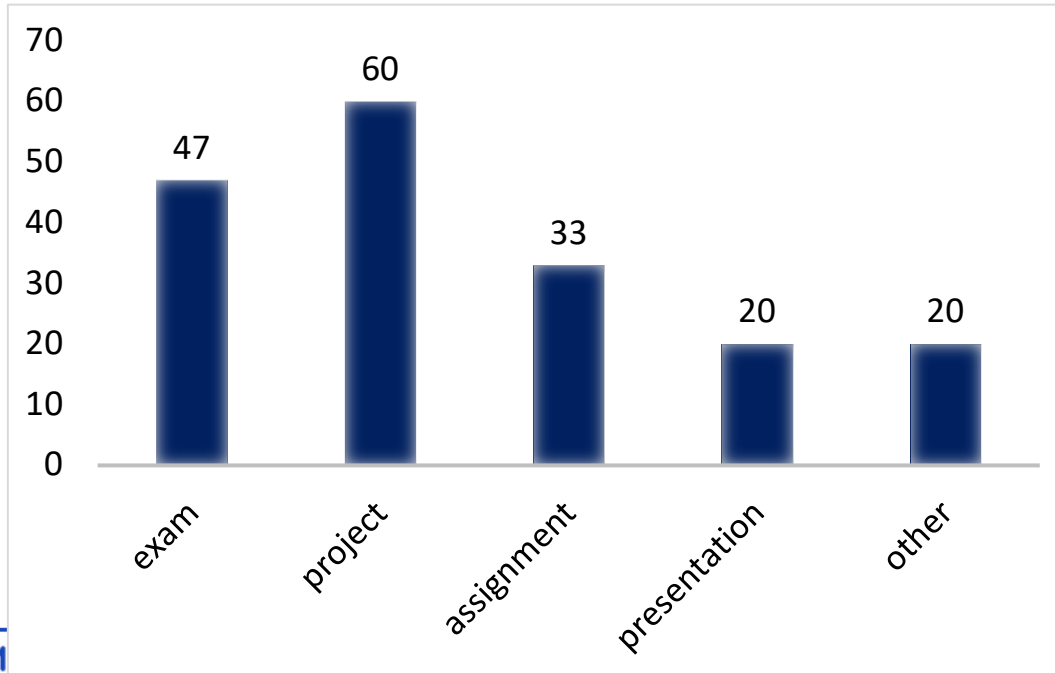
- ✓ Lectures
- ✓ Laboratory work
- ✓ Tutorials
- ✓ Project work

Teaching methodology



- ✓ «In the second half of the semester, students can participated in a team project in which they can apply and discuss the learned concepts and methods in a freely selectable application context». (TU Munich, Augmented Reality course)
- ✓ «In their own work, students will be asked to design an own project from idea, via implementation, testing, evaluation, demonstration, to documentation. In this way they will experience the full lifecycle of a practical project, as they will face it once they leave the university in either industry or research» (Trinity College Dublin, Augmented Reality)

Assessment



Example of assessment for AR course

- ✓ Assignments: 30%
- ✓ Projects: 30%
- ✓ Final Exam: 30%
- ✓ Class participation: 5%
- ✓ Exam Submission: 5%

Can we use AR to teach AR?

Thank you for attention!

www.ifmo.ru

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