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Use Blackboard´s forum if a question may be relevant to other students, too. Email always both joeran.beel@scss.tcd and doug.leith@scss.tcd.ie. Give a meaningful subject, starting with "*[ML1819]*". No file attachments.

Week 01 (1): Introduction to the Module

CS7CS4/CS4404 Machine Learning

Version 4: 2018-09-22 16:09

Dr Joeran Beel
Assistant Professor in Intelligent Systems
Department of Computer Science and Statistics
Trinity College Dublin, Ireland

Dr Douglas Leith
Professor in Computer Systems
Department of Computer Science and Statistics
Trinity College Dublin, Ireland

Re-Scheduled Lectures and Labs

- ~~Tuesday 11th Sept. 15:00-16:00~~ --> **Monday 17th Sept. 18:00-19:00 in the McNeil Lecture Theatre (Hamilton Building)**
- **Lab Sessions only take place when explicitly announced (keep all dates free in your calendar). Keep in mind, there are different times (and rooms ?) for CS7CS4 and CS4404.**

https://cdn.iphonelife.com/sites/iphonelife.com/files/Reschedule-Appointments-by-Dragging-and-Dropping-Calendar-Events.jpg

Outline

1. **The lecturers**
2. **The Magic of Machine Learning**
3. **The module**
4. **Expectations & Rules**
5. **You**

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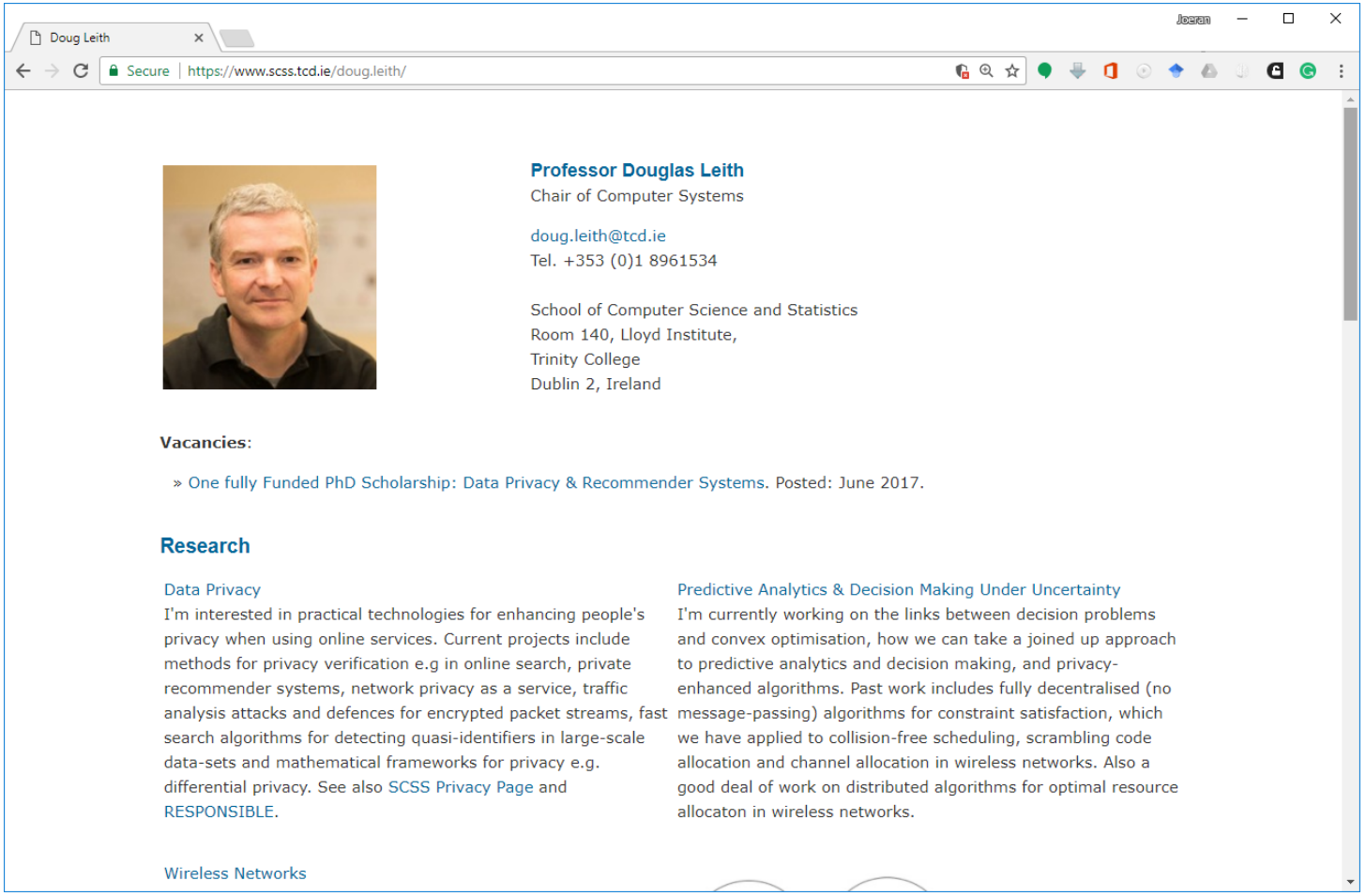
The Lecturers

Douglas Leith

https://www.scss.tcd.ie/doug.leith/

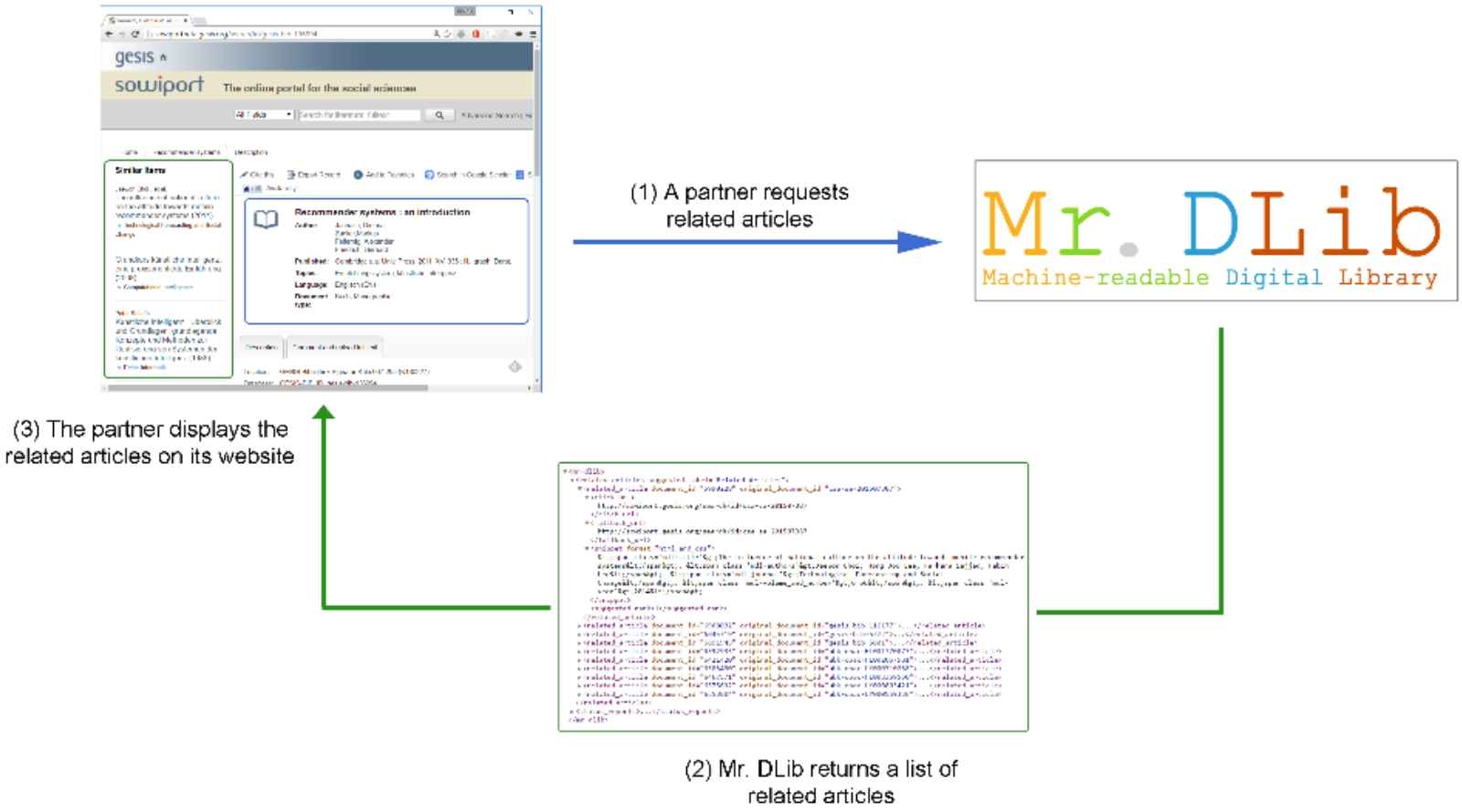


Joeran Beel

Career

Mr. DLib: Recommendations-As-a-Service

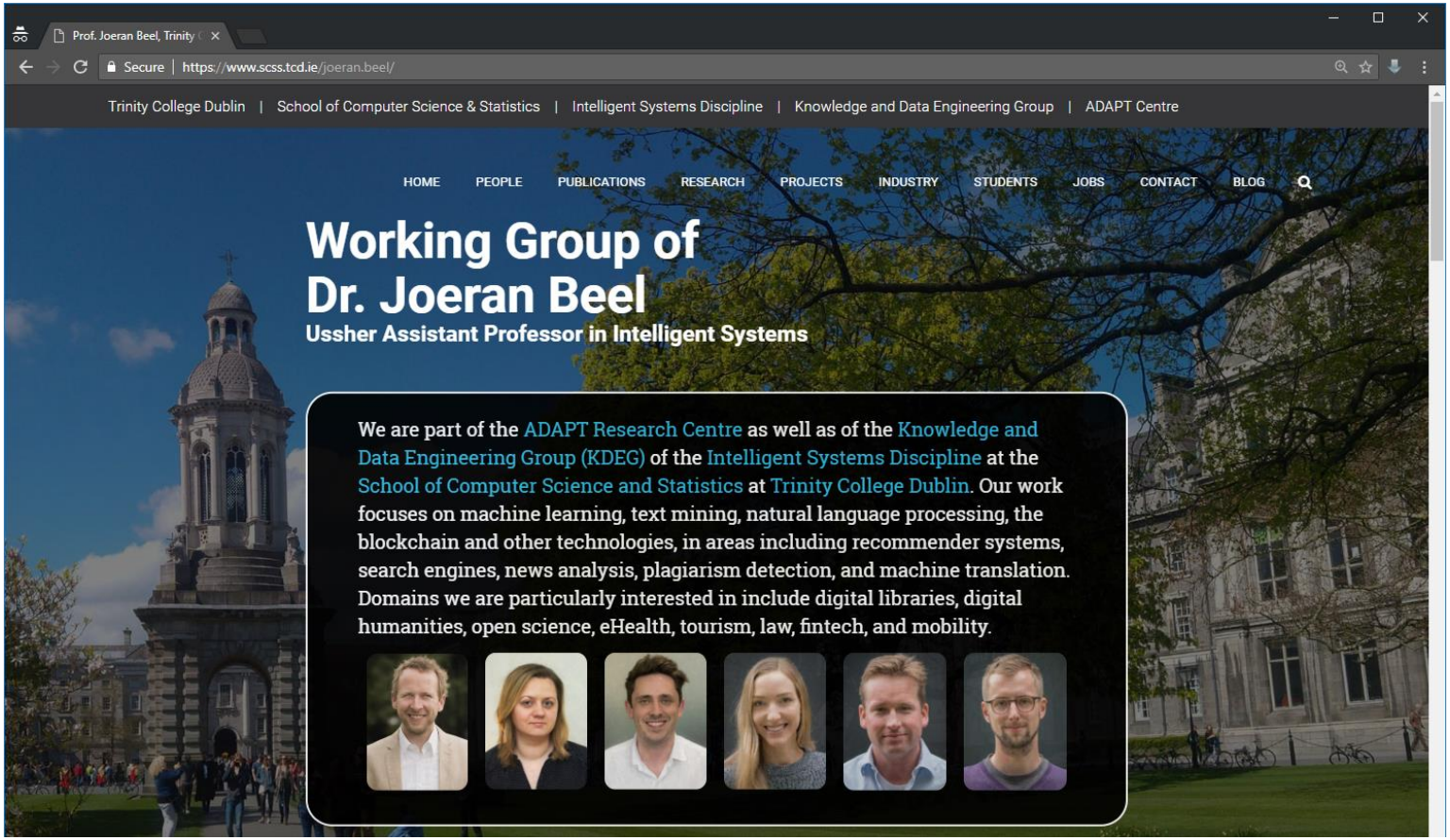
http://mr-dlib.org



Joeran Beel

Website

- **https://www.scss.tcd.ie/joeran.beel/**



Project Opportunities

- **Voluntary Work with Mr. DLib Team http://mr-dlib.org**
- **Research internship at NII, Tokyo**
  - Duration: 3-6 months
  - Compensation: 171,000 JPY/per month (~ 1300€)
  - Details https://scss.tcd.ie/postgraduate/structuredphd/earrach_sakura_award.php

http://nandanbuildcon.com/wp-content/uploads/2016/09/outgoing-projects.jpg

Life in Tokyo and Japan

Life in Tokyo and Japan

Life in Tokyo and Japan

Life in Tokyo and Japan






Life in Tokyo and Japan

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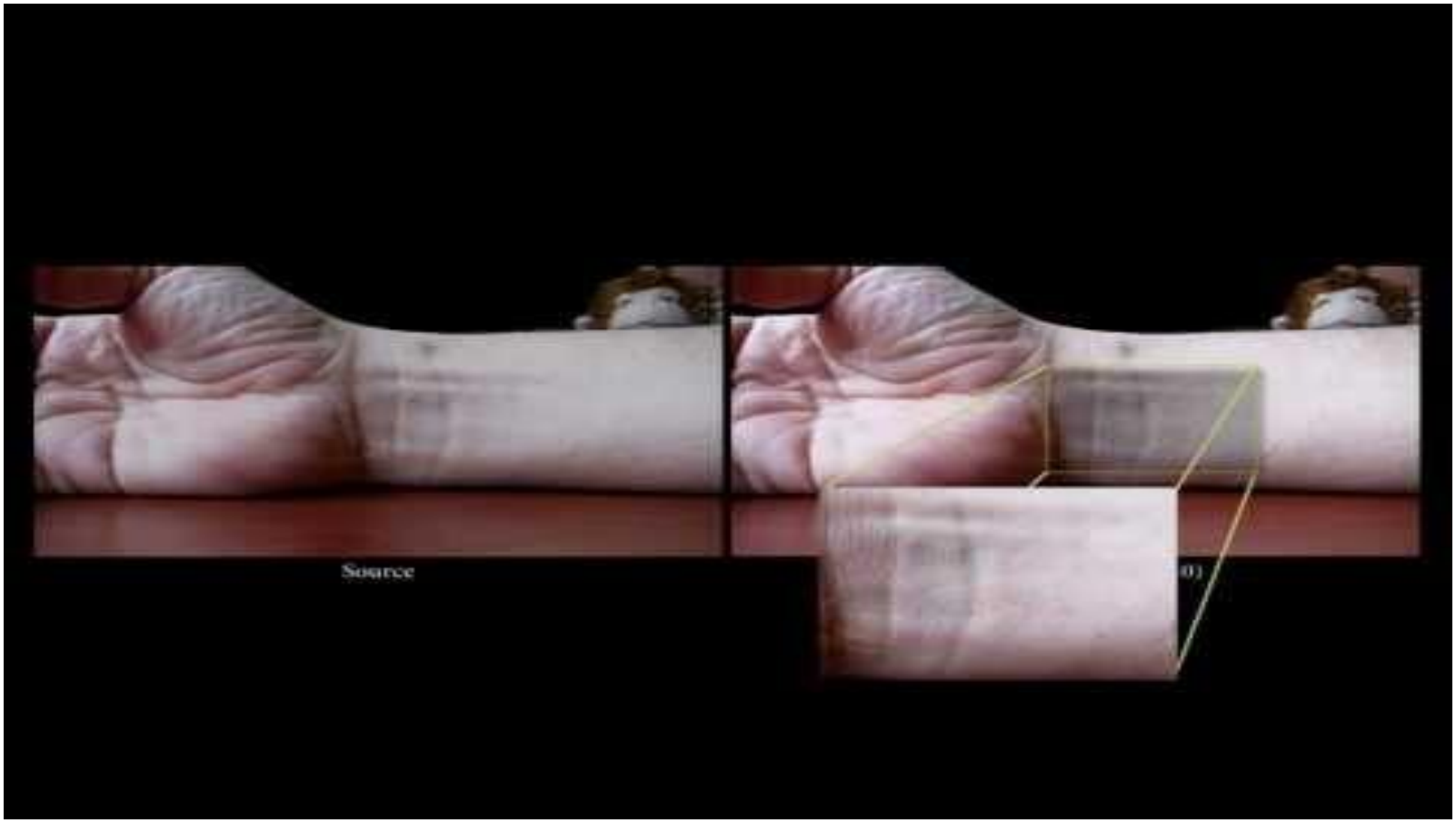
Final-Year Projects

Final Year Projects Dissertations

- **Find supervisor soon**
- **https://studentprojects.scss.tcd.ie**
- **My project ideas https://joeranbeel.atlassian.net/wiki/spaces/BEEL/pages/133333043/Final-Year+Projects+Dissertations**

Using Invisible Motions for ML or RecSys

- **https://www.youtube.com/watch?v=ONZcjs1Pjmk (1:28 and 3:18)**



The Magic of Machine Learning

(What can Machine Learning Do?)

Obama and Machine Learning

- **https://www.youtube.com/watch?v=cQ54GDm1eL0**

Artificial Photo and Video Creation

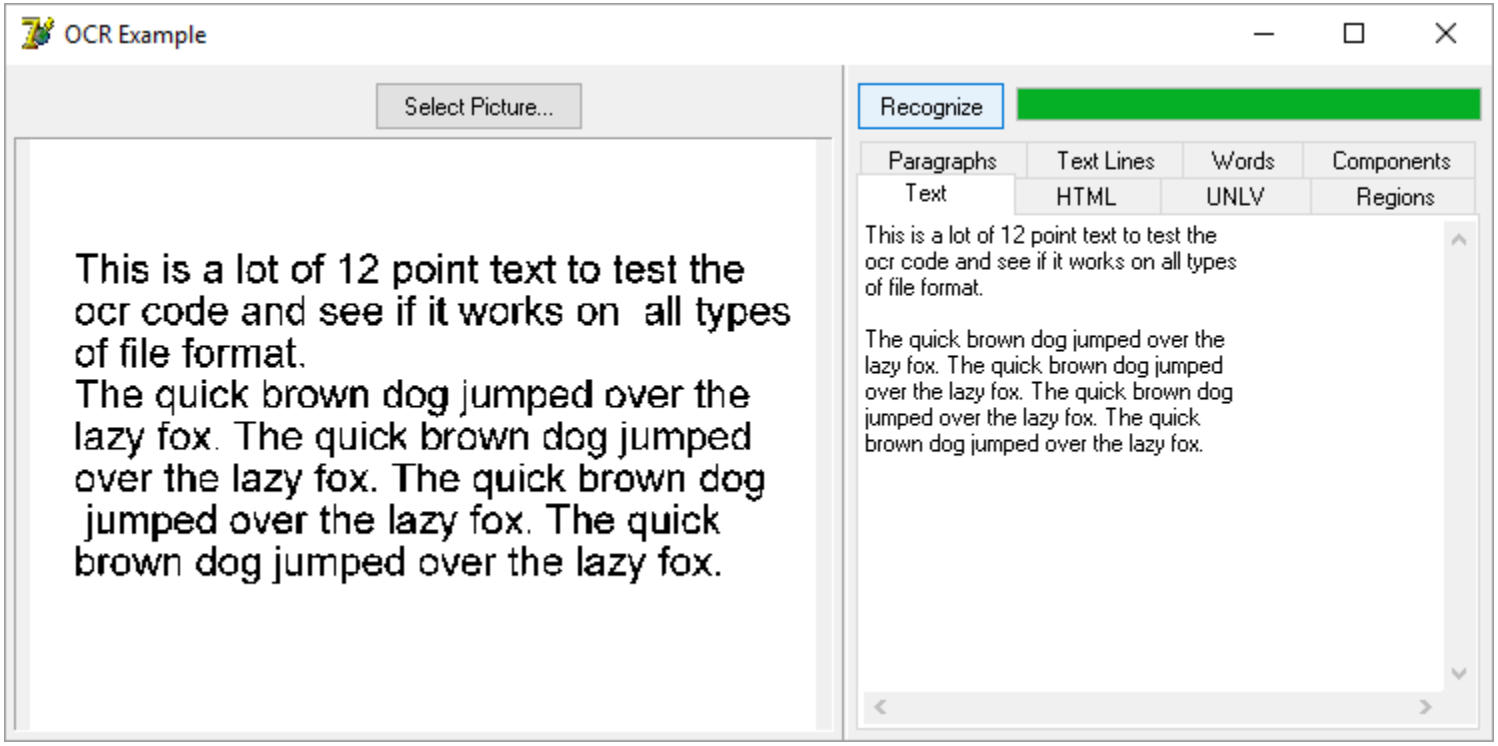
- **https://www.youtube.com/watch?v=3AIpPlzM_qs**

Dance Video

- **https://www.youtube.com/watch?v=PCBTZh41Ris**

- https://ai.googleblog.com/2018/05/duplex-ai-system-for-natural-conversation.html
- **Who is the machine?**

Optical Character Recognition (OCR)



https://www.winsoft.sk/ocrdemo.png

Spam Detection

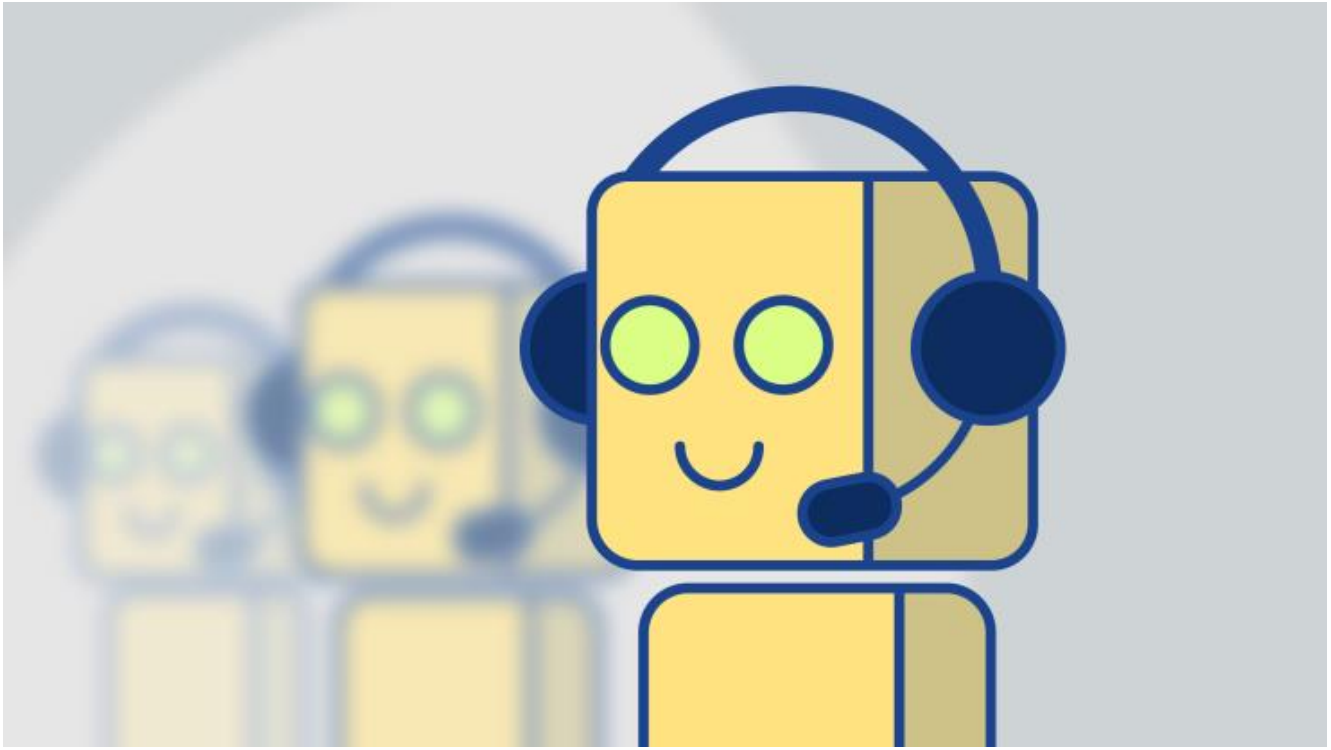
https://i1.wp.com/securitytraning.com/wp-content/uploads/2016/11/Spam-filter.jpg?fit=1024%2C632&ssl=1

Fraud Detection

http://the-military-guide.com/wp-content/uploads/2013/01/Credit-Card-Fraud.jpg

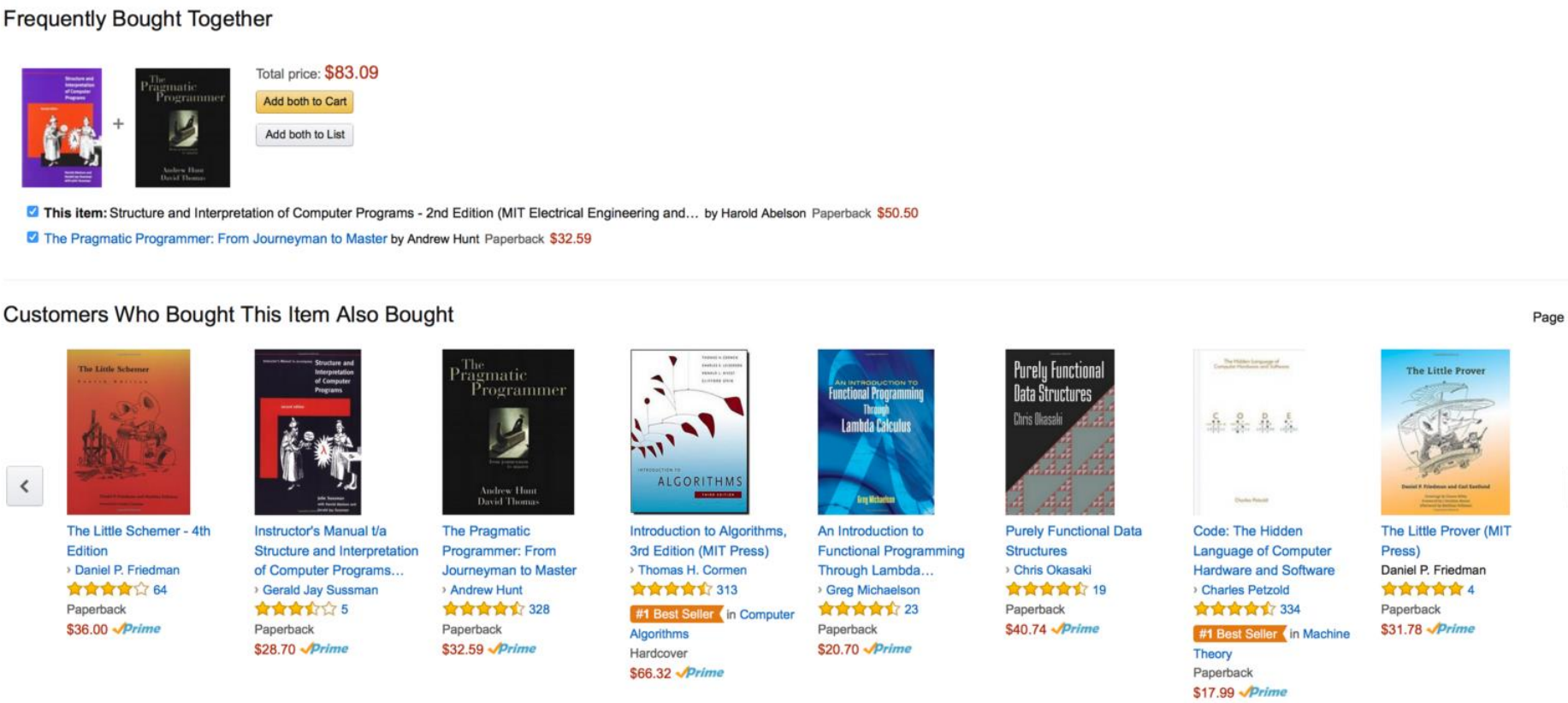
Customer Service / Chat Robots

- **Alternative to simple phone robots or keyboard inputs**
- **Answering natural language questions**



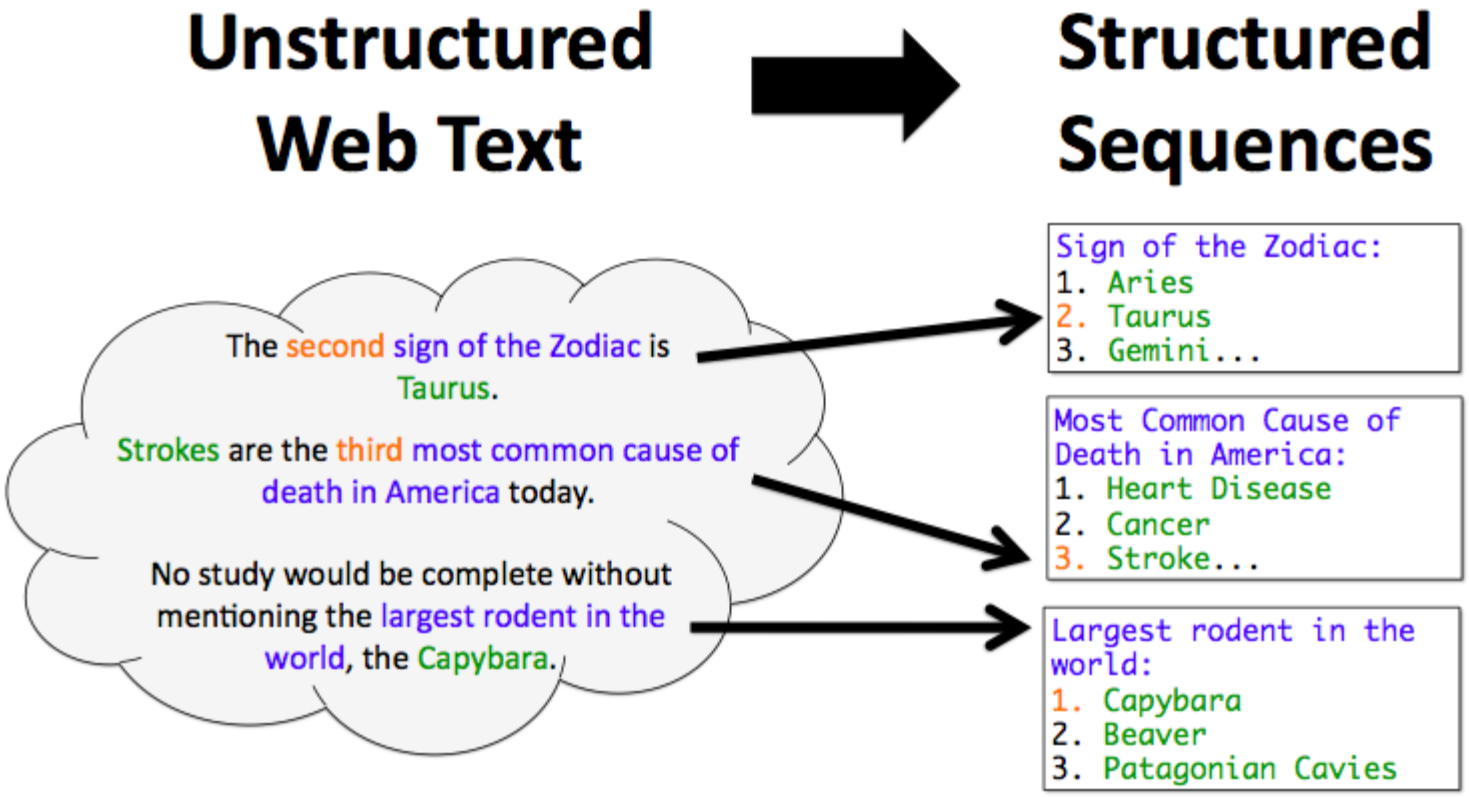
https://tctechcrunch2011.files.wordpress.com/2016/05/robot-customer-service.png?w=738

Recommendation / Personalisation



https://cdn-images-1.medium.com/max/1600/1*UEIb9b7VT0u5NMBeZajxjg.png

Information Extraction



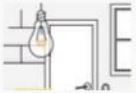
http://seyferseed.ru/wp-content/uploads/2016/05/Screen_shot_2010-09-11_at_9.36.44_AM.png

https://techcrunch.com/2017/08/29/deepl-schools-other-online-translators-with-clever-machine-learning/

Machine Translation

Google
DeepL
machine learning
Translation
Artificial Intelligence

Popular Posts


Google reveals the top things people want to find out 'How to' do
a week ago


Ten years later, 'Sunshine' remains one of the bleakest and most beautiful sci-fi movies ever made
3 days ago


Xiaomi's first phone running stock Android looks impressive and costs less than $250
3 days ago


Google Drive goes down and takes worldwide productivity with it

DeepL schools other online translators with clever machine learning

Posted Aug 29, 2017 by Devin Coldewey, Frederic Lardinois (@fredericl)

Tech giants Google, Microsoft and Facebook are all applying the lessons of machine learning to translation, but a small company called DeepL has outdone them all and raised the bar for the field. Its translation tool is just as quick as the outsized competition, but more accurate and nuanced than any we've tried.

Crunchbase

Facebook

FOUNDED
2004

OVERVIEW
Facebook is an online social networking service that allows its users to connect with friends and family as well as make new connections. It provides its users with the ability to create a profile, update information, add images, send friend requests, and accept requests from other users. Its features include status update, photo tagging and sharing, and more. Facebook's profile structure includes ...

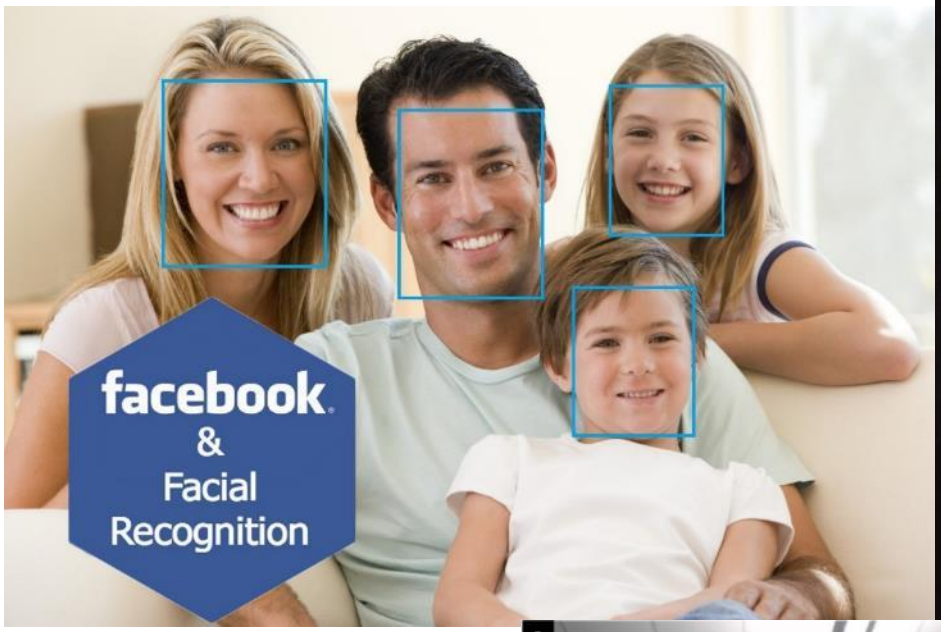
Autonomous Driving

https://www.2025ad.com/fileadmin/user_upload/Evergreen/Mission/Challenges/Making_self_driving_safe/MAIN_IMAGE_16x9.jpg

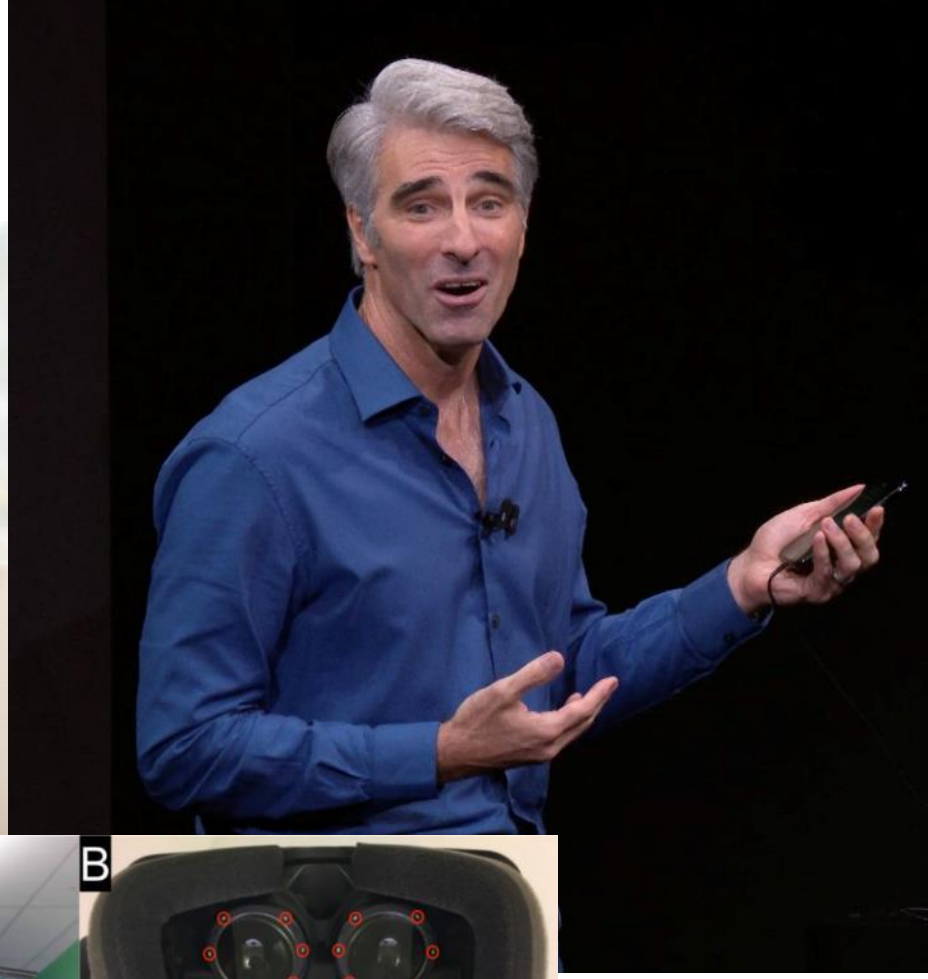
Speech Recognition

http://cdn.iphoneincanada.ca/wp-content/uploads/2016/10/AppleSiri1TNW-1200x651.jpg

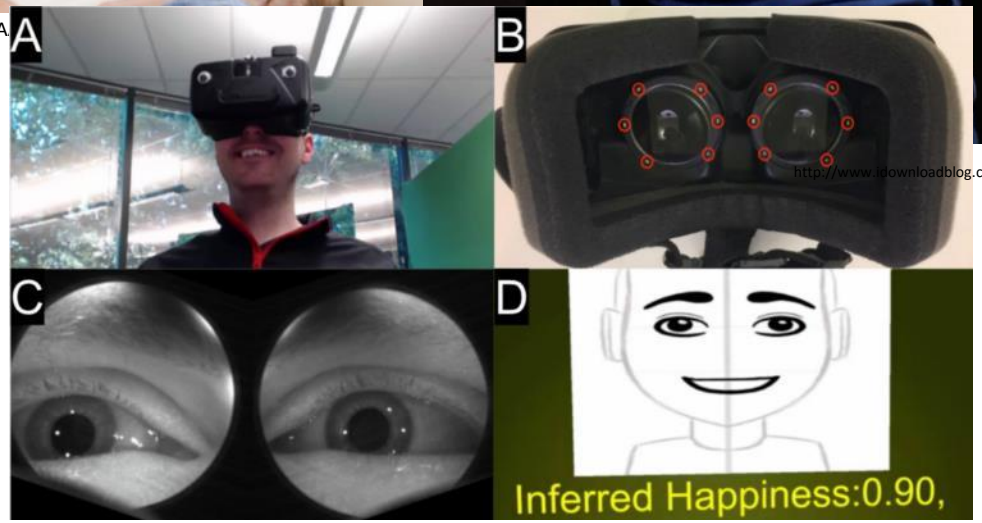
Face Recognition



http://2.bp.blogspot.com/-uy3K0rhmEiE/Vne0r1Jv6yI/AAAAAAAAAAA/face_recognition.jpg



http://www.idownloadblog.com/2017/09/15/craig-federighi-interview-face-id/

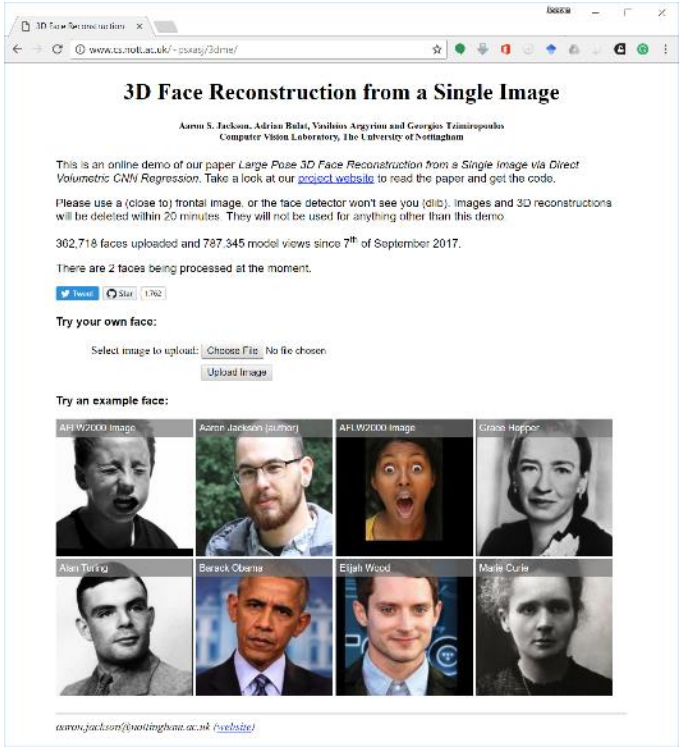


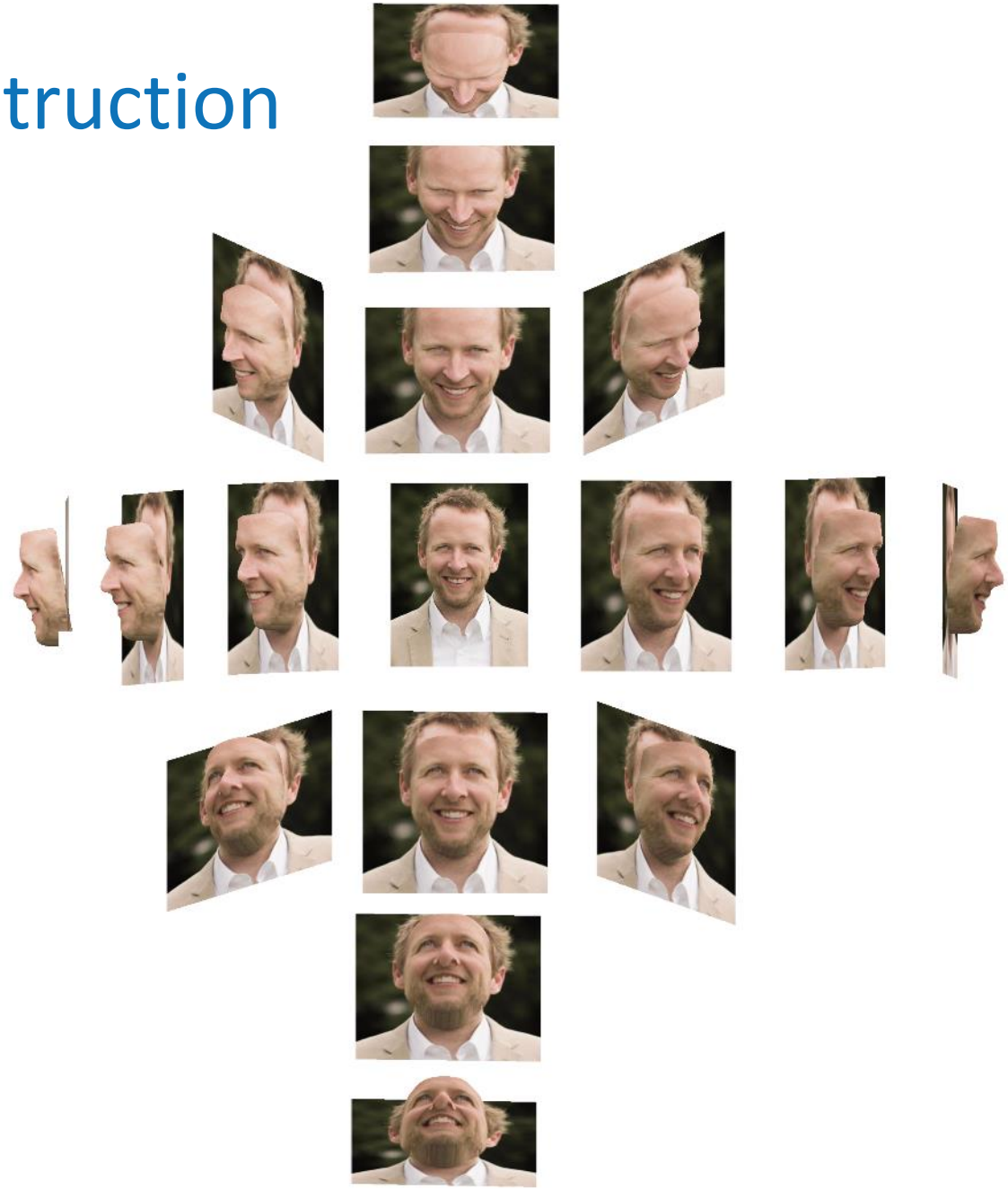
https://techcrunch.com/2017/07/28/using-eye-smiles-to-predict-the-state-of-your-whole-face-in-vr

3D Face Reconstruction

http://www.cs.nott.ac.uk/~psxasj/3dme/

http://aaronsplace.co.uk/papers/jackson2017recon/

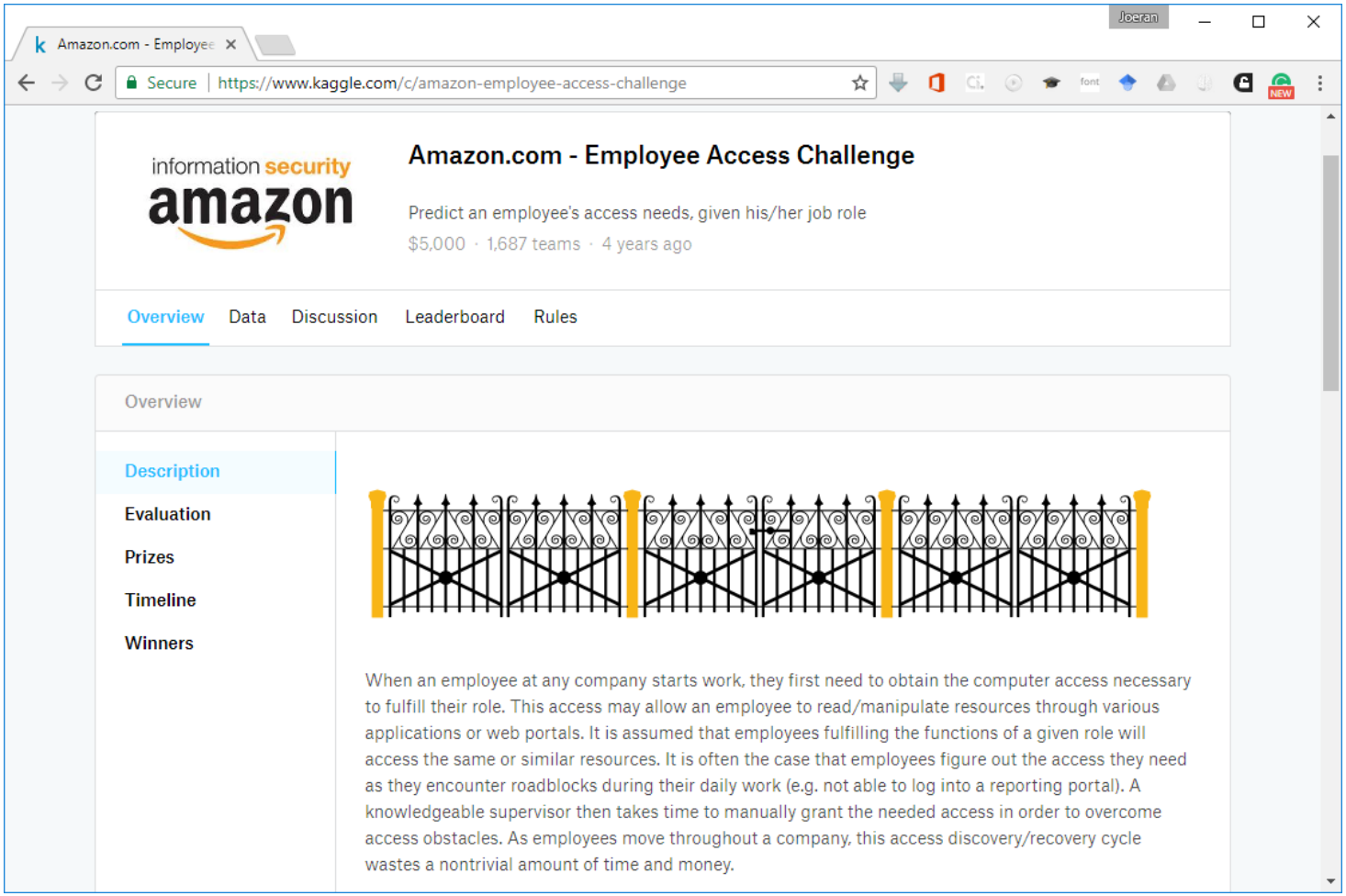




Medical Diagnosis

https://ww2.kqed.org/futureofyou/wp-content/uploads/sites/13/2016/11/computerdoc-1020x680.png

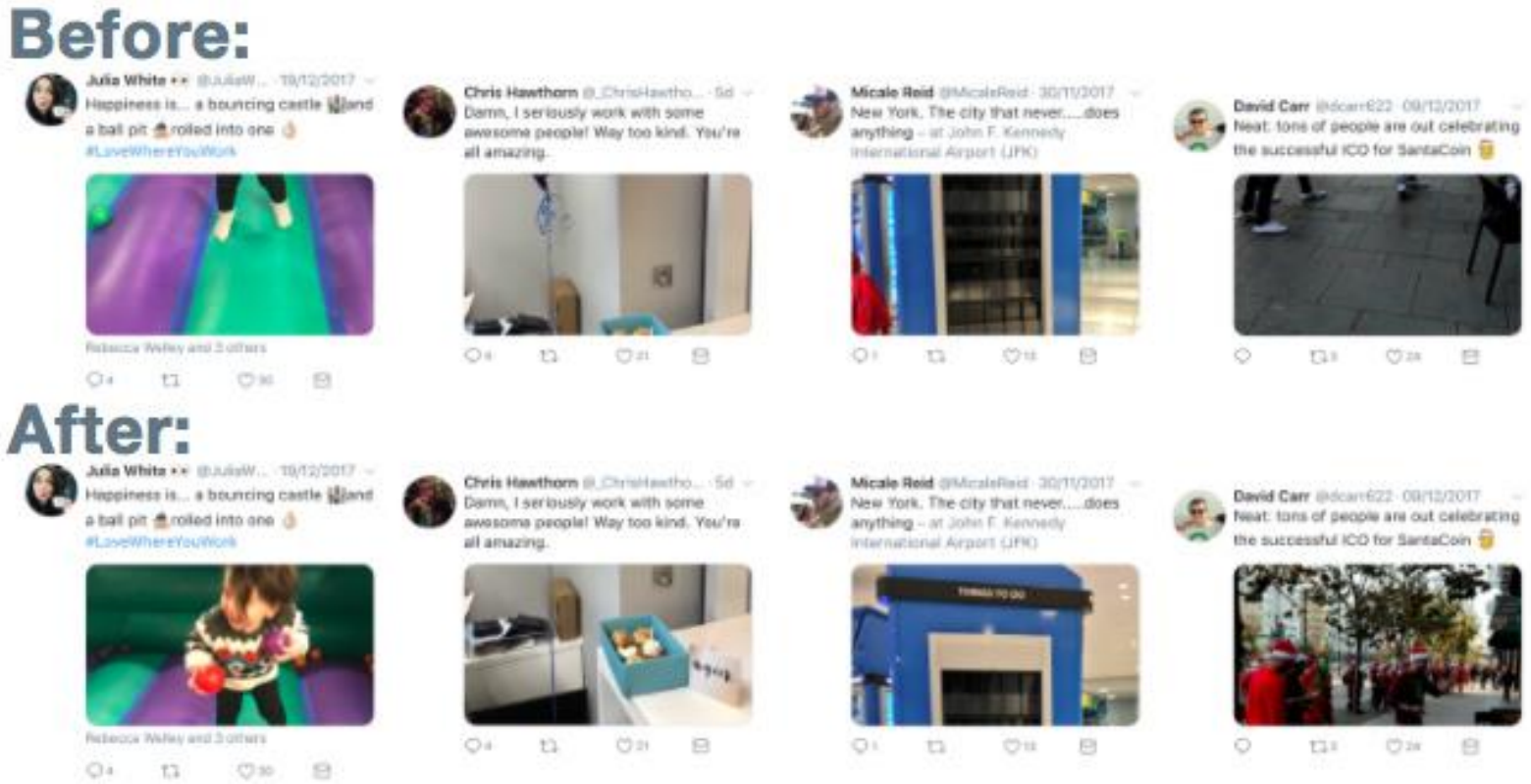
Employee Access Rights



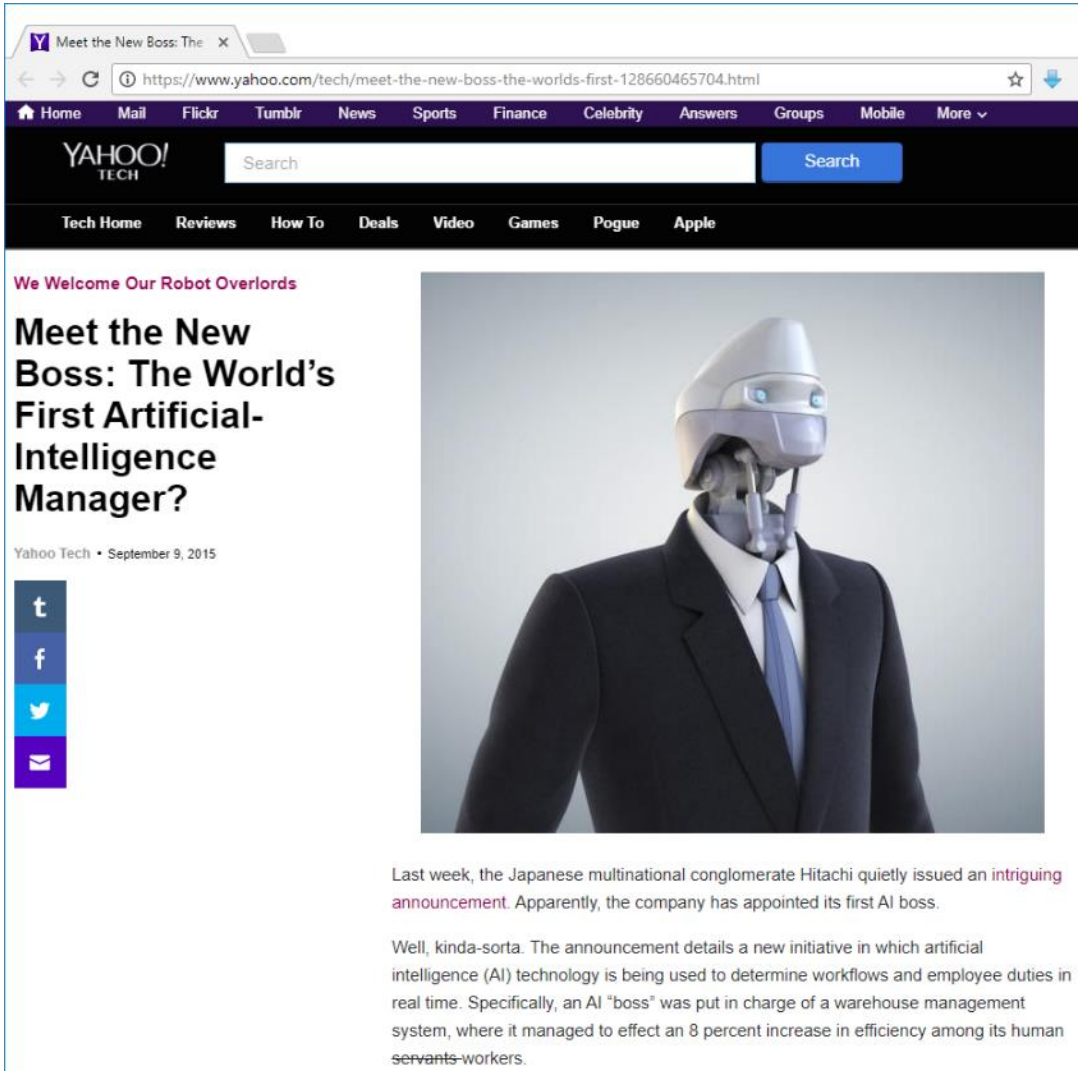
https://www.kaggle.com/c/amazon-employee-access-challenge

Cropping Images

- **https://www.dpreview.com/news/6095193348/twitter-is-using-ai-to-intelligently-crop-photos-around-the-eye-catching-bits**



Assigning Tasks to Employees

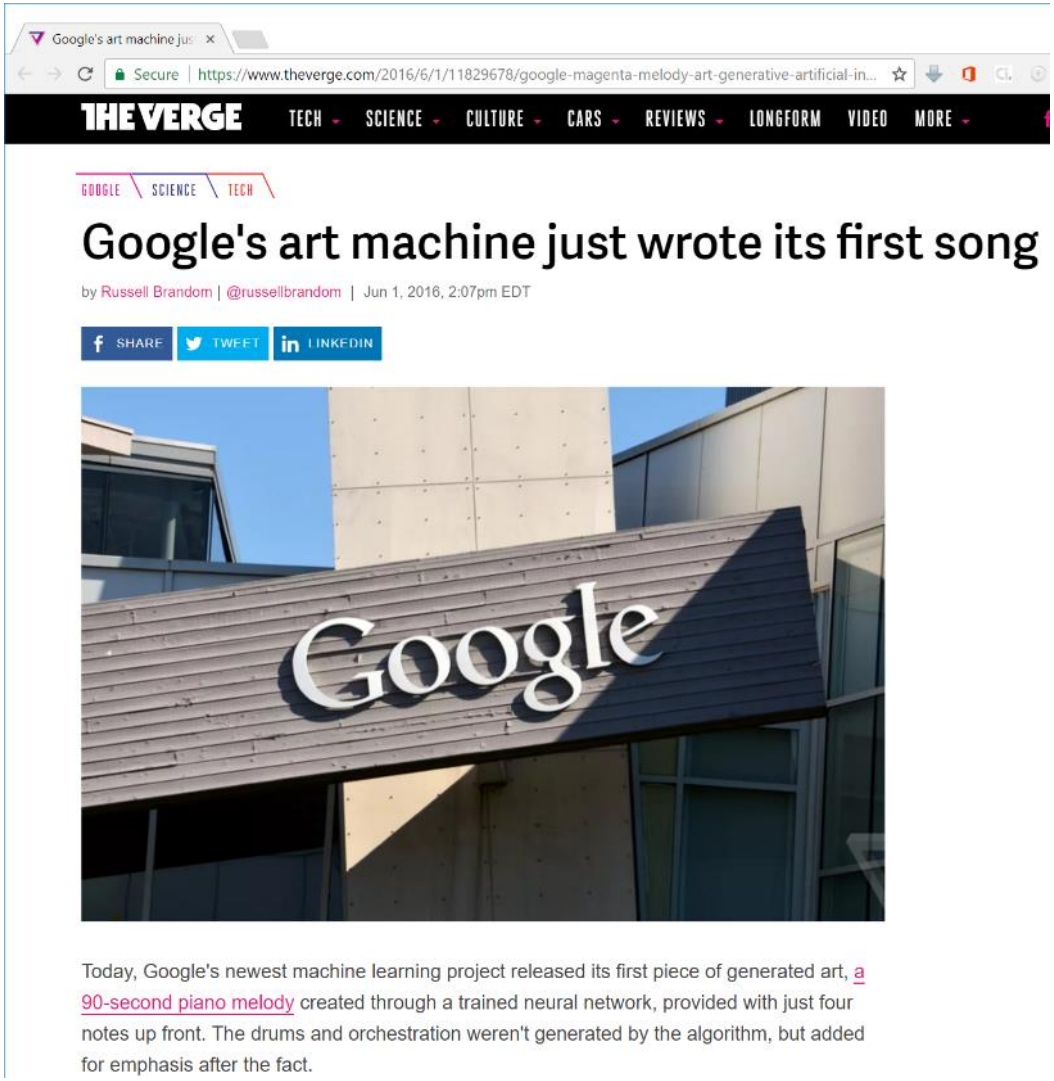


https://finance.yahoo.com/news/meet-the-new-boss-the-worlds-first-128660465704.html

Compose Music

Example of Aiva.ai:

https://soundcloud.com/user-95265362/sets/genesis



https://www.theverge.com/2016/6/1/11829678/google-magenta-melody-art-generative-artificial-intelligence

Create and Extend Art

Innovations

This algorithm can create a new Van Gogh or Picasso in just an hour

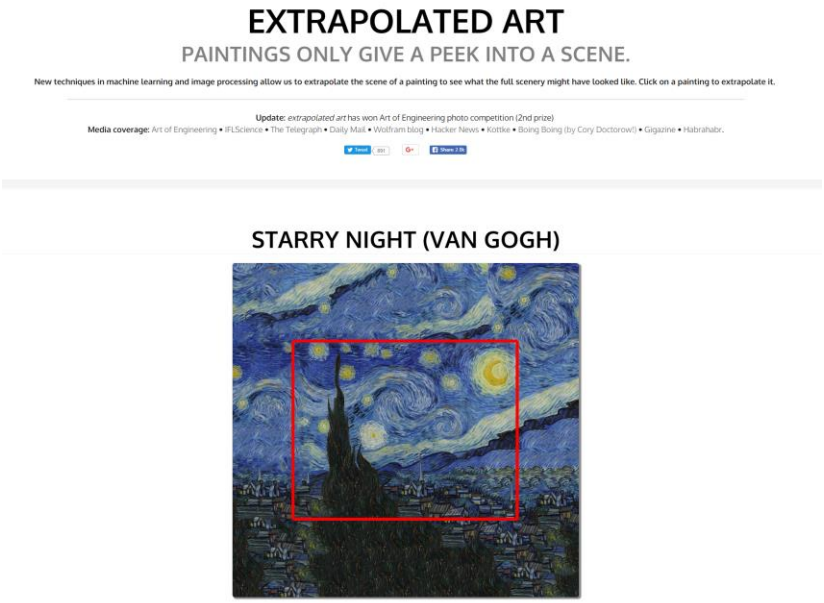
By Matt McFarland August 31, 2015

The algorithm was given this photo of buildings, left, and a copy of Vincent Van Gogh's "The Starry Night." In about an hour it taught itself to mimic Van Gogh's style, and apply it to the photo of the buildings. (University of Tuebingen)

For great artists, creating a masterpiece is the culmination of a career. Years of practice, creative musings and experimentation with styles build up to the genesis of something truly original and timeless.

A story is often told about Pablo Picasso charging an enormous sum for a portrait. The

https://www.washingtonpost.com/news/innovations/wp/2015/08/31/this-algorithm-can-create-a-new-van-gogh-or-picasso-in-just-an-hour/?utm_term=.783a59c7da3d



http://extrapolated-art.com/

Taking Care of Elderly

https://www.good.is/articles/robots-elder-care-pepper-exoskeletons-japan

Satisfy Sexual Needs

THE Sun

THE SUN, A NEWS UK COMPANY

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ROBOT PHWOARS World's first brothel staffed entirely by robot sex workers now looking for investors to go global

Lumidolls opened its first controversial bordello in Barcelona, Spain in February

By Jon Lockett
30th July 2017, 12:47 pm | Updated: 31st July 2017, 7:29 pm

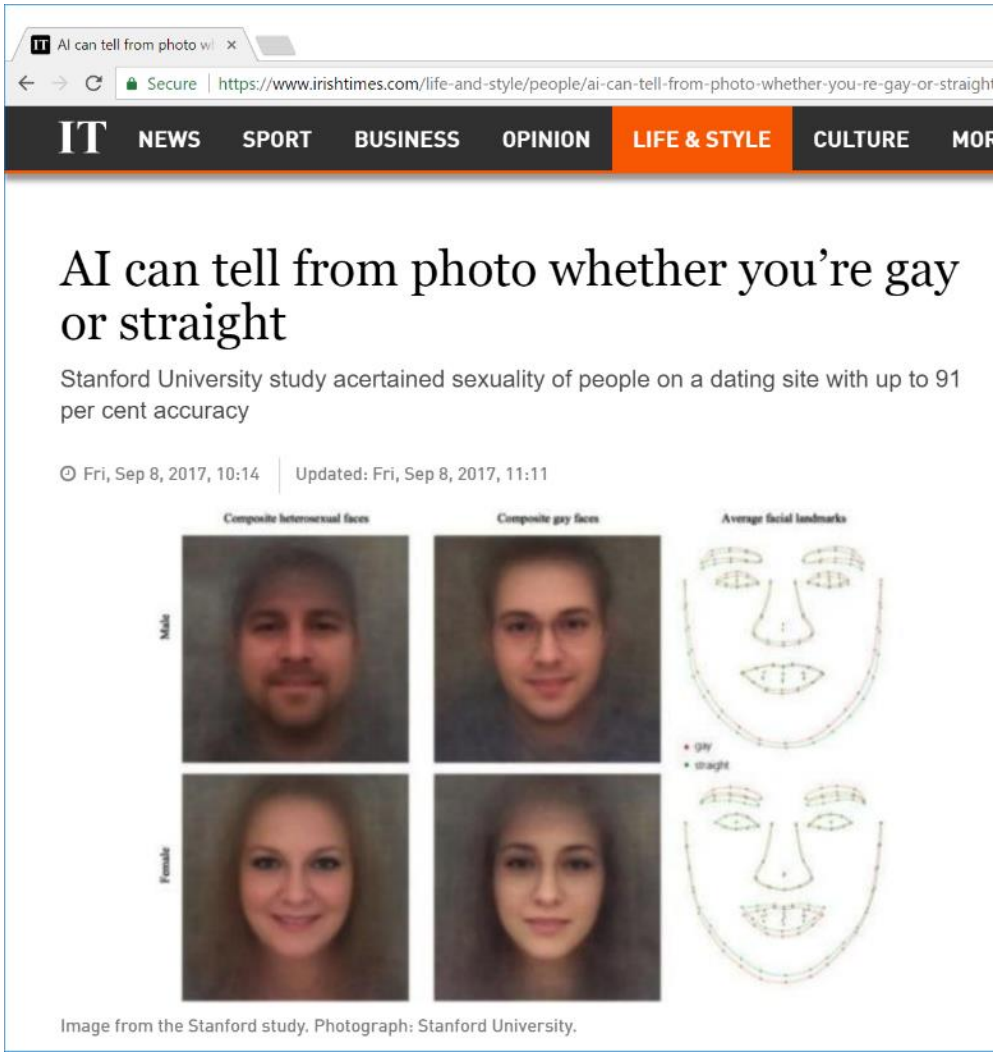
3 COMMENTS

THE owners of the world's first brothel staffed by robot sex workers are reportedly in talks to open others around the globe.

Lumidolls opened its first controversial sex outlet in Barcelona, Spain in February – near the city's popular tourist spots.

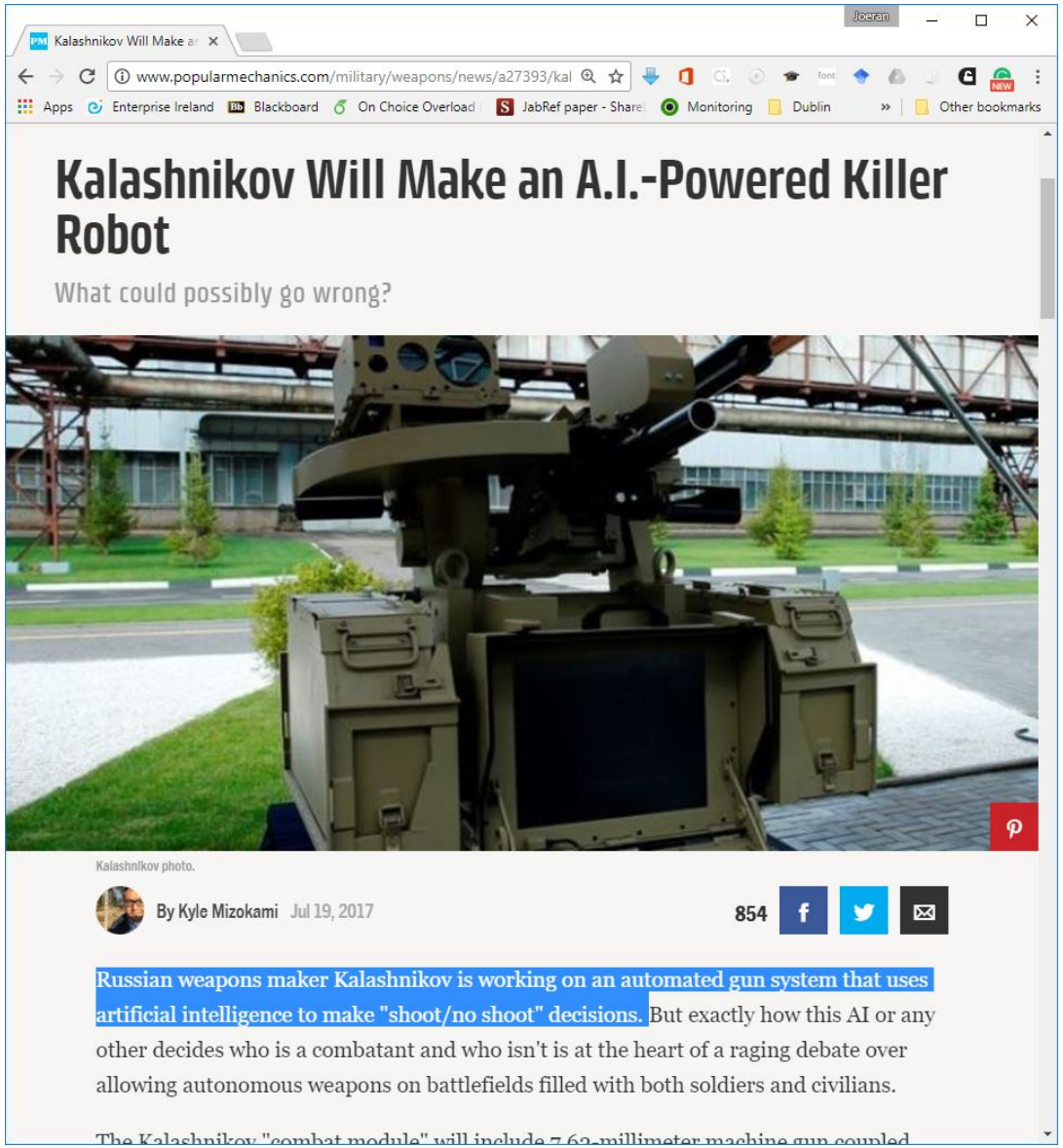
https://www.thesun.co.uk/news/4131258/worlds-first-brothel-staffed-entirely-by-robot-sex-workers-now-looking-for-investors-to-go-global/

Predict Personality/Traits/Preferences/…



https://www.irishtimes.com/life-and-style/people/ai-can-tell-from-photo-whether-you-re-gay-or-straight-1.3214062

Kill Enemies



Kalashnikov Will Make an A.I.-Powered Killer Robot

What could possibly go wrong?

Kalashnikov photo.

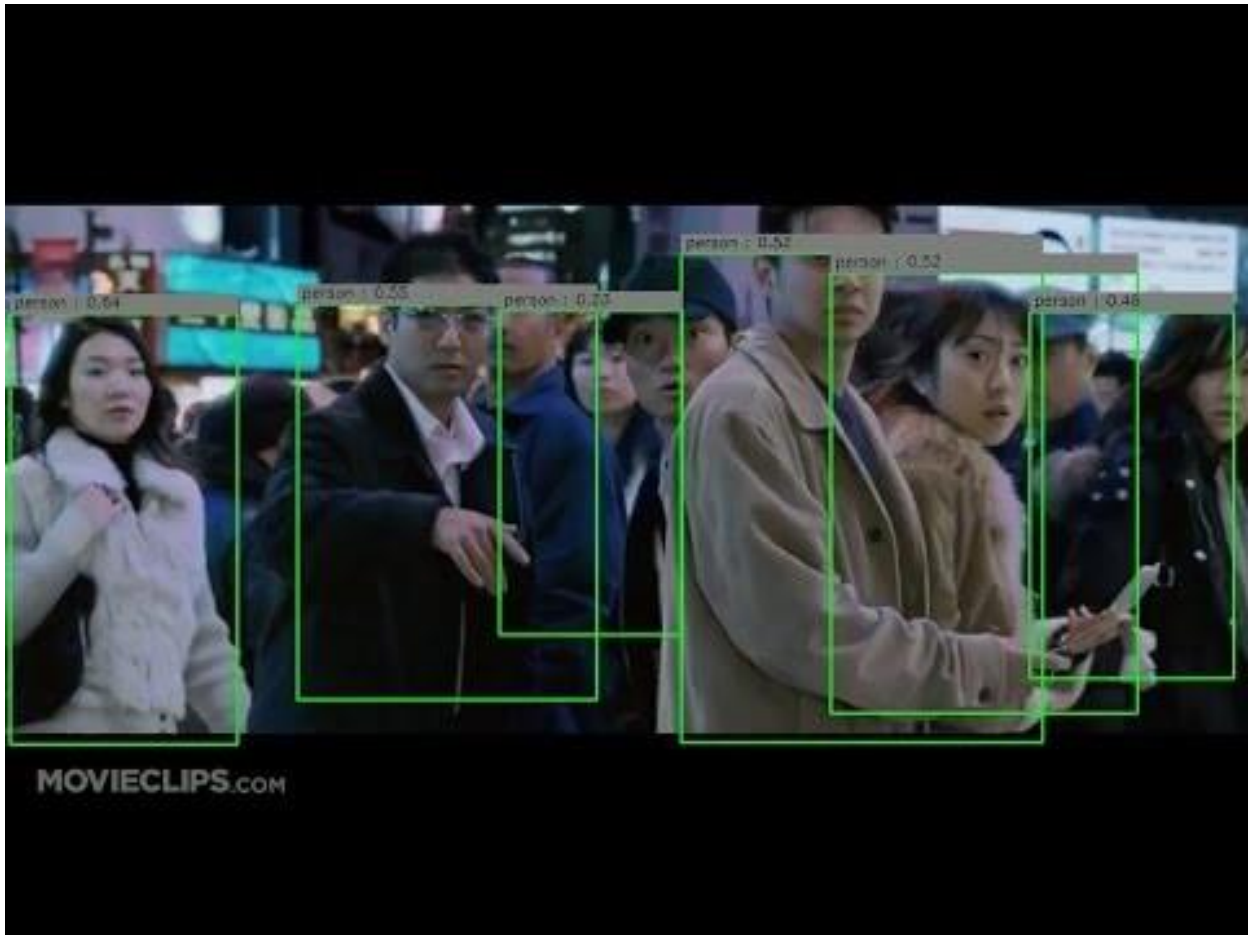
By Kyle Mizokami Jul 19, 2017 854

Russian weapons maker Kalashnikov is working on an automated gun system that uses artificial intelligence to make "shoot/no shoot" decisions. But exactly how this AI or any other decides who is a combatant and who isn't is at the heart of a raging debate over allowing autonomous weapons on battlefields filled with both soldiers and civilians.

http://www.popularmechanics.com/military/weapons/news/a27393/kalashnikov-to-make-ai-directed-machine-guns/

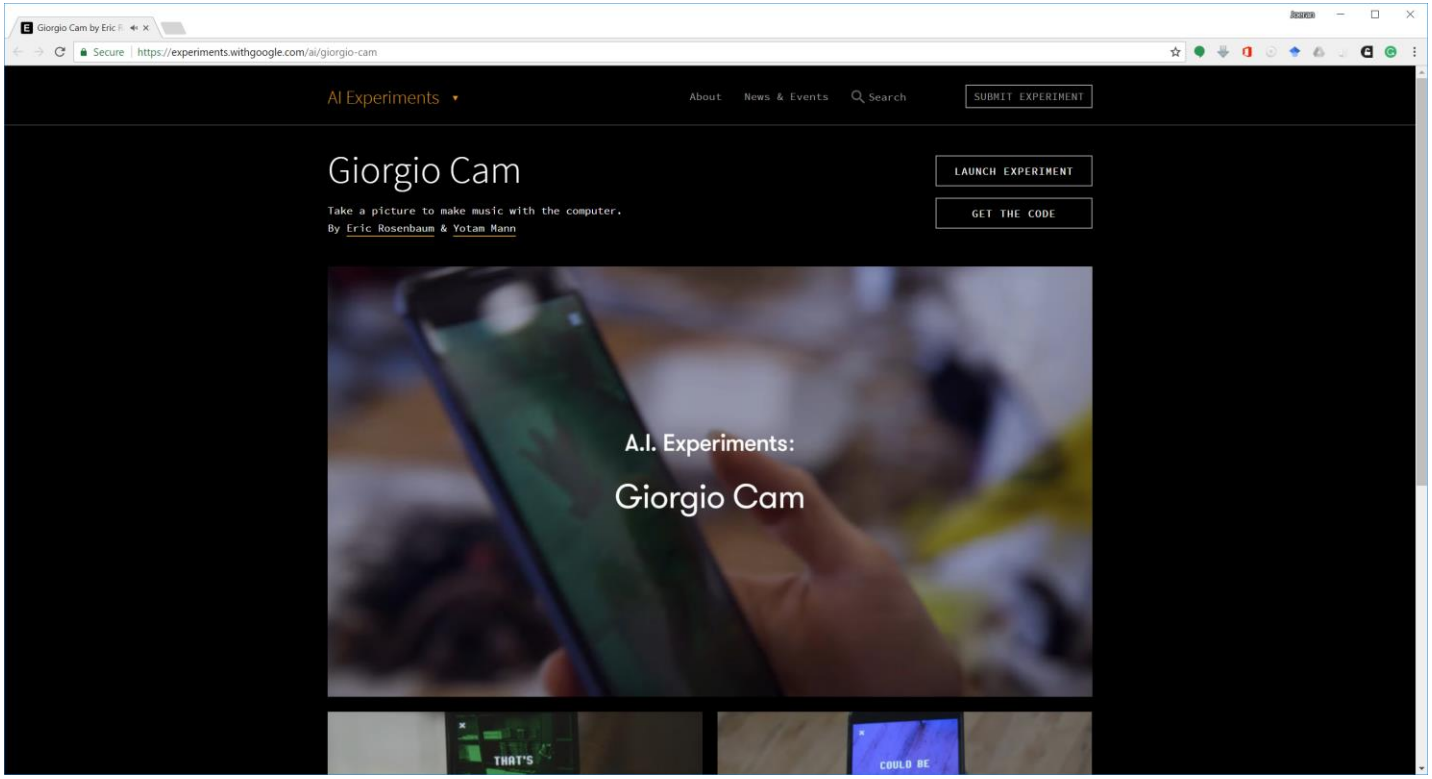
Object Recognition

https://www.youtube.com/watch?v=EJy0EI3hfSg



Object Recognition (2)

- https://experiments.withgoogle.com/ai/giorgio-cam/view/
- https://experiments.withgoogle.com/ai/giorgio-cam



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Introduction to the Module

Module Structure & Grading

- **Lectures**
  - 22 lectures, 1 hour each, 2 per week
- **Some lab sessions**
- **Assessment**
  - Exam, 2 hours (60% of the final grade)
  - Course Work (40% of the final grade)
  - Supplemental Exam, 2 hours (100%)

Lectures

(Subject to change)

1. **Week: Introduction**
2. **Week: Linear Regression**
3. **Week: Classification & Probabilistic Interpretation**
4. **Week: SVM & Kernel Methods**
5. **Week: Data Processing and ML Frameworks**
6. **Week: ML Evaluation**
7. **Week: Study Week**
8. **Week: Unsupervised Learning**
9. **Week: Guest Lectures and one other topic (recommender systems?)**
10. **Week: Neural Networks**
11. **Week: Deep Learning**
12. **Week: TBA (Adversarial ML; Ethics; Curriculum Learning; Meta Learning; …?)**

Plus: Critical Thinking, Project Management, and Professional Communication

Course/Project Work

- **Course work = 40% of final marks**
- **Individual Programming Assignments (10%)**
  - Linear Regression
  - Logistic Regression
  - Support Vector Machines
  - Unsupervised Machine Learning
- **Group Research Assignments**
  - Goal: Answer a simple research question
    - How strong is the impact of dataset size on machine learning effectiveness?
    - How consistent are different evaluation metrics?
    - How effective are neural networks in solving simple problems?
  - Poster (10%)
  - Short Paper (20%)
- **Group Building**
  - Groups consist of 3 students
  - Ideally self selected, otherwise random group building
  - More details soon

Exam

- **A mix of**
  - Multiple choice
  - Open-answer questions
  - Potentially Calculations/programming (on paper)
- **Example exams (and answers) will be provided**

Schedule / Deliverables (2018-09-22)

Subject to changes

- **All deadlines are 8:00 o´clock in the morning (Irish time), if not stated otherwise**
- **This schedule may be changed during the next weeks. Changes will be announced during lectures and/or on Blackboard**

Teaching Week (!= Term Week)	Lecturer	Lecture Title	Labs	Deadlines
Week 1	Joeran	Intro to the module		
		Intro to ML		
Week 2	Doug	Linear Reg. I		
		Linear Reg. II		
Week 3	Doug	Classification	Lab: Academic Writing & Research Project Introduction	
		Probabl. Interpretation		28th September; Group Preferences
Week 4	Doug	SVM		
		Kernel Methods		3rd October; Own Project Ideas (1st Chance) 5th October; Programming I (Linear Regression) 5th October; Project Preferences (1st Chance)
Week 5	Joeran	Data Handling and ML Frameworks		
		Feature Selection		12th October; Programming II (Logistic Regression)
Week 6	Joeran	Evaluation I		
		Evaluation II		15th October; Own Project Ideas (Last Chance) 18th October; Project Preferences (Last Chance) 19th October; Programming III (Support Vector Machines)
Week 7		Study Week		
Week 8	Doug	Unsupervised Learning I		29th October; Research I
		Unsupervised Learning II		
Week 9	Doug & Joeran	Guest Lecture		
	Doug	Recommenders ?		
Week 10	Joeran	Neural Nets I		
		Neural Nets II		16th November; Programming IV (Unsupervised Learning)
Week 11	Joeran	Neural Nets III (Deep Learning)		
		Neural Nets IV (Deep Learning)		
Week 12	Joeran	Misc (Ethics, Adversarial ML, Metalearning, Currc. Learning)		
		Recap; Lecture Evaluation		2nd December; Research II

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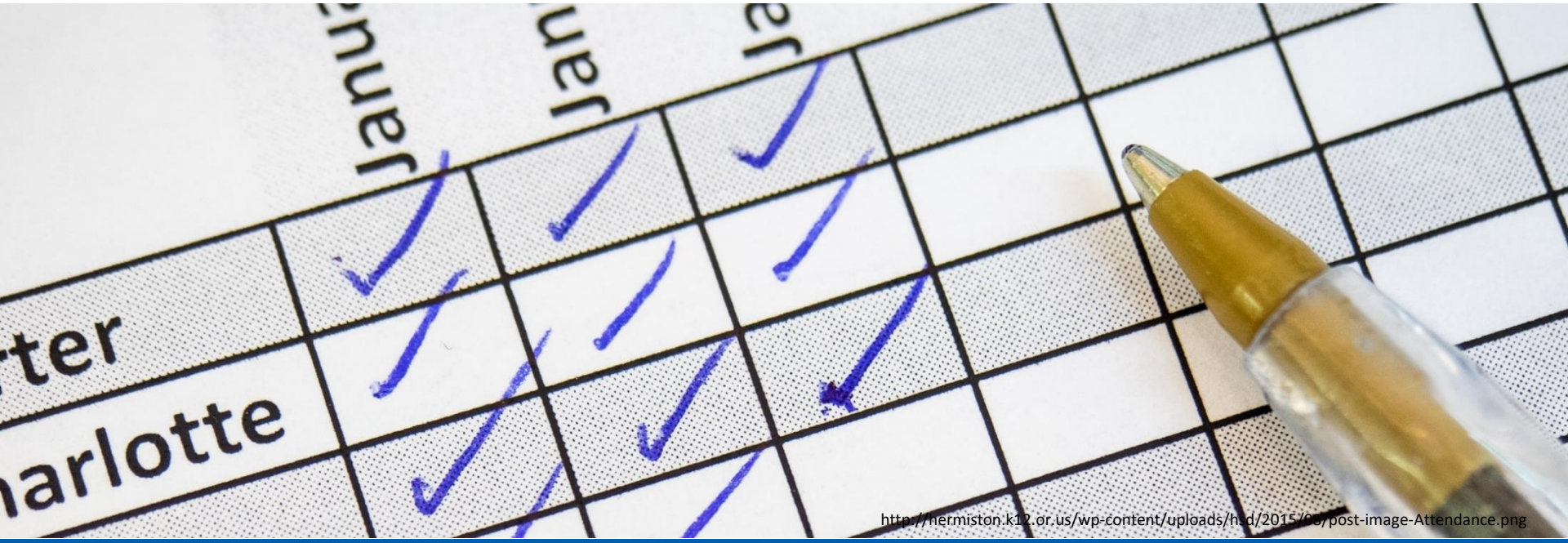
Expectations & Rules

Attendance

- **Attendance is optional (not for guest lecture though) but recommended.**
- **If you attend, be on time!**
- **You don‘t need to inform us, if you don‘t attend**
- **In case of serious sickness: get a medical confirmation and let the administration (and us) know.**



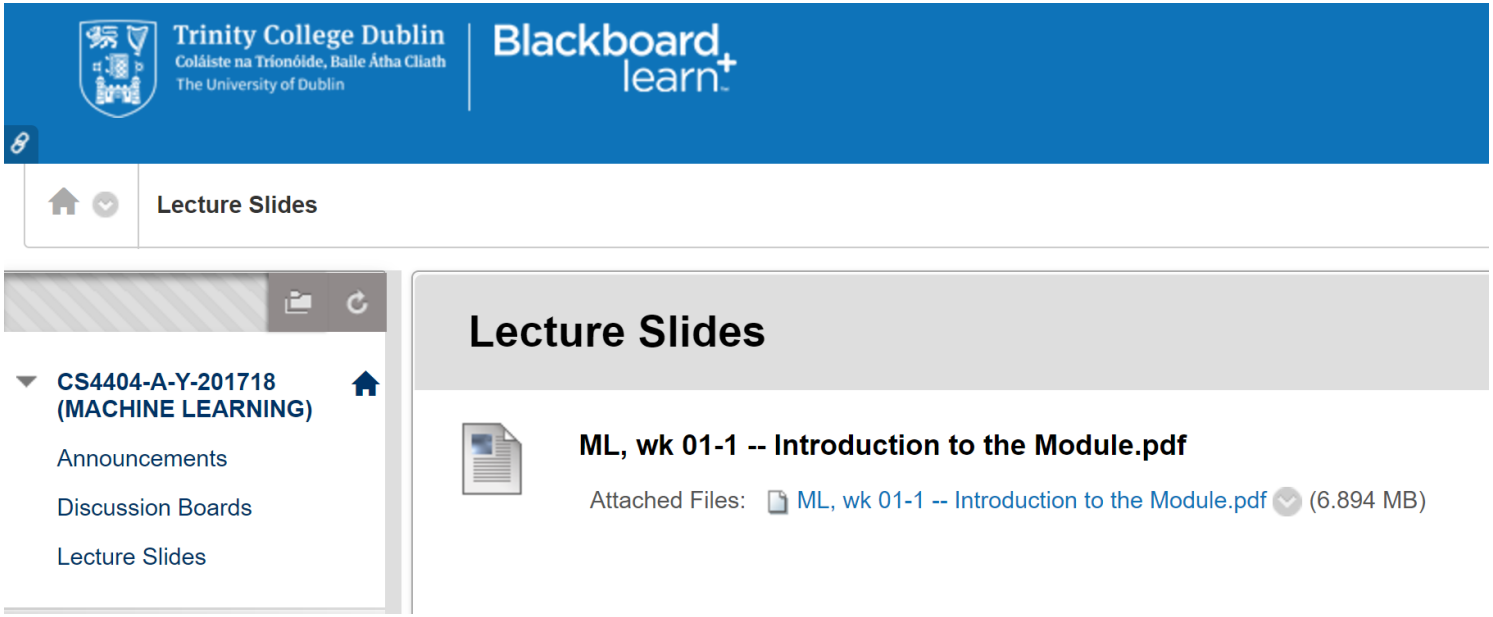
http://hermiston.k12.or.us/wp-content/uploads/hsd/2015/08/post-image-Attendance.png

Our Expectations

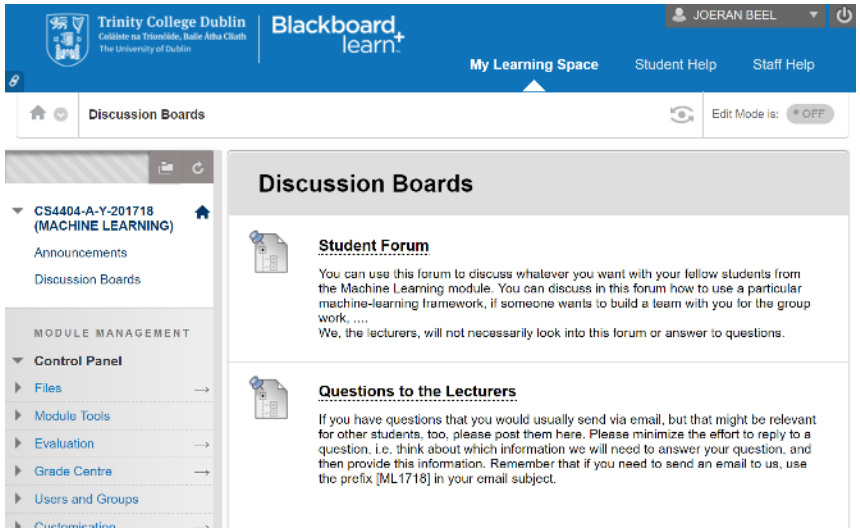
- **We begin and conclude the lecture; you acknowledge via knocking on the desks (German style ☺)**
- **If you attend lectures:**
  - Be on time, sharp!
  - Only lecture-related use of electronic devices
  - No noisy typing
  - No talking
  - No phone ringing (switch to silent/airplane mode)
  - Unpack your stuff before the lecture begins, and pack your stuff after the lecture concludes

Lecture Slides

- **Lecture Slides are available on Blackboard. Slides are typically available a few hours or days before the lecture starts. However, it may be that we upload updated versions of the slides either after the lecture or some minutes before the lecture begins.**

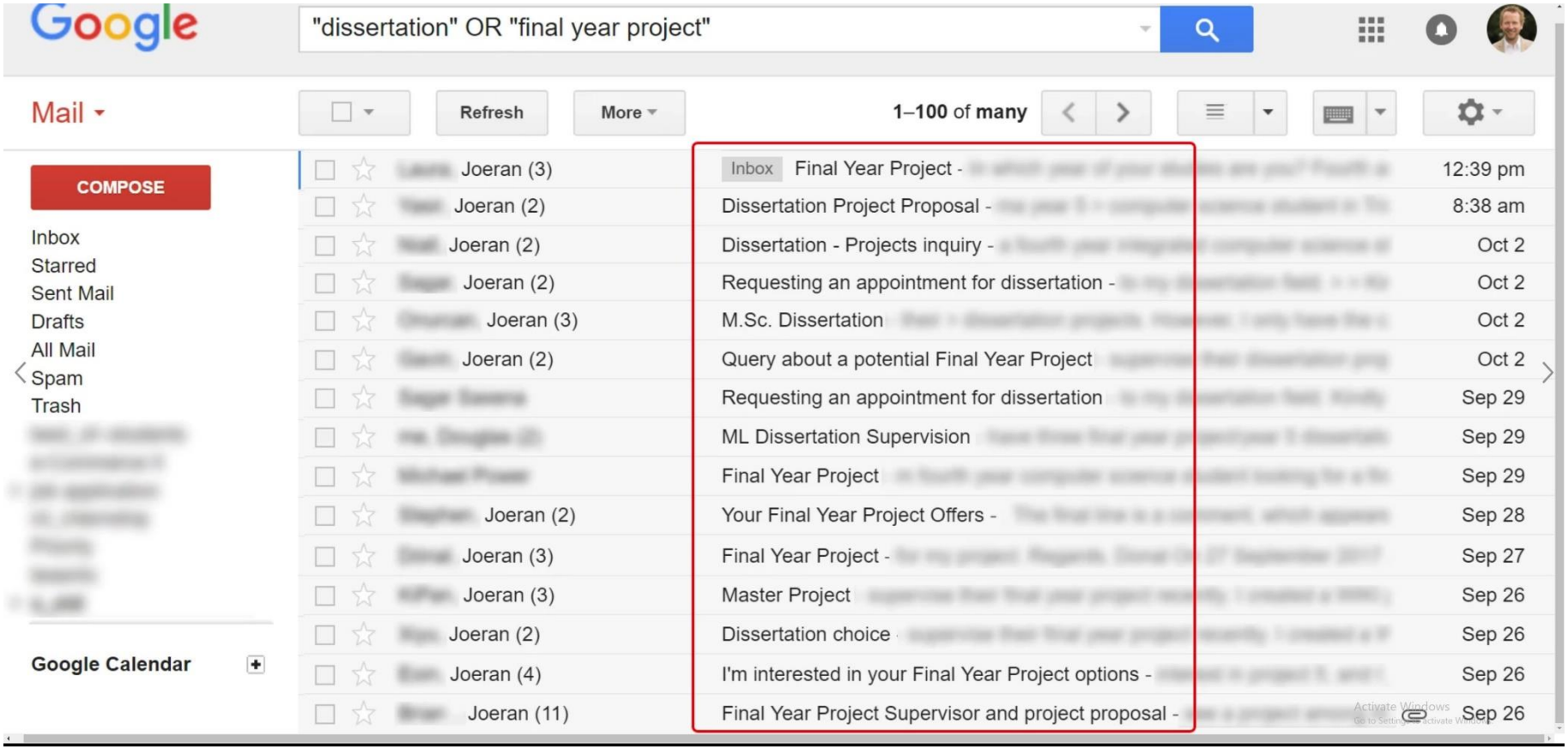


Contacting us



- **Whenever something could be relevant for others**
  - Blackboard forum
  - Send us email reminder if you don't get an answer within 2 working days
- **For sensitive/private matters: Email**
  - Always to both Joeran.beel@scss.tcd.ie & doug.leith@scss.tcd.ie
  - Email subject
    - Use "[ML1819]" as prefix (e.g. "[ML1819] Cannot attend guest lecture").
    - Meaningful subjects ("~~[ML1819] appointment~~" vs. "[ML1819] Request for appointment to discuss group-project problems (team 141)")
  - No files via email (instead, send Dropbox/gDrive link etc.)
  - New email-threads for new topics: When you want to discuss a new topic, please do not hit the "reply" button in an existing email thread. Instead, create a new email with a new subject. For instance, if you have previously sent an email titled "Questions about internship at NII in Tokyo", do not send an email in the same thread to ask when you can hand in the assignment for the Machine Learning course. Instead, create a new email titled e.g. "ML research assignment 1 hand-in date".
  - Some more advise https://www.scss.tcd.ie/joeran.beel/students_corner/communication-guidelines/

(Negative) Example



Rules

- **Plagiarism: If we catch you, you fail the entire module (or worse). We run plagiarism checks with tools like Turnitin; Moss; …**
- **Deadlines are deadlines. Even 1 minute late is too late. Only exception: serious illness (medical certificate required).**
  - Penalty for a late marked deliverable (e.g. assignment): 0 marks for that deliverable
  - Penalty for a late unmarked deliverable (e.g. project preference submission): deduction of 3 marks from final course-work marks.
- **Let us know about (potential) problems as soon as possible. Telling us one day before a deadline that you had a cold three weeks ago, is no excuse.**

Group Work Guidelines

- **In case of group work, penalties apply to all team members. Advise: Think about how to prevent problems once the teams are build (agree about rules, take meeting minutes, exchange contact details, have a backup plan for sickness, accidents, or low motivation of team members, …). Most importantly: have written evidence of all important decisions!**
- **Underperformance in group work: If team members feel that one team member strongly underperforms, the following steps are to be taken, as soon as possible**
  - The team tries to find a solution with the particular team member in a personal discussion as soon as possible.
  - If the particular team member continues to underperform, the team contacts the lecturer, and provides written evidence (meeting minutes, emails, …) of the ongoing underperformance and the team's attempts to find a solution.
  - The lecturer will schedule a meeting with all team members, or discusses the matter via email. Depending on the evidence, the lecturer may decide to reduce the course work marks of the particular's team member by up to 50% (e.g. 30 marks instead of the group's 60).
  - If the particular team member continues to underperform, the team contacts the lecturer again, and provides written evidence of the ongoing underperformance.
  - In another meeting or email, the lecturer may decide to deduct further marks from the particular team member, and, if necessary, to remove the team member from the team (resulting in 0 marks for the course work for that team member)

(Critical/Constructive) Feedback and Ideas

Always welcome!!! Even by email ;-)

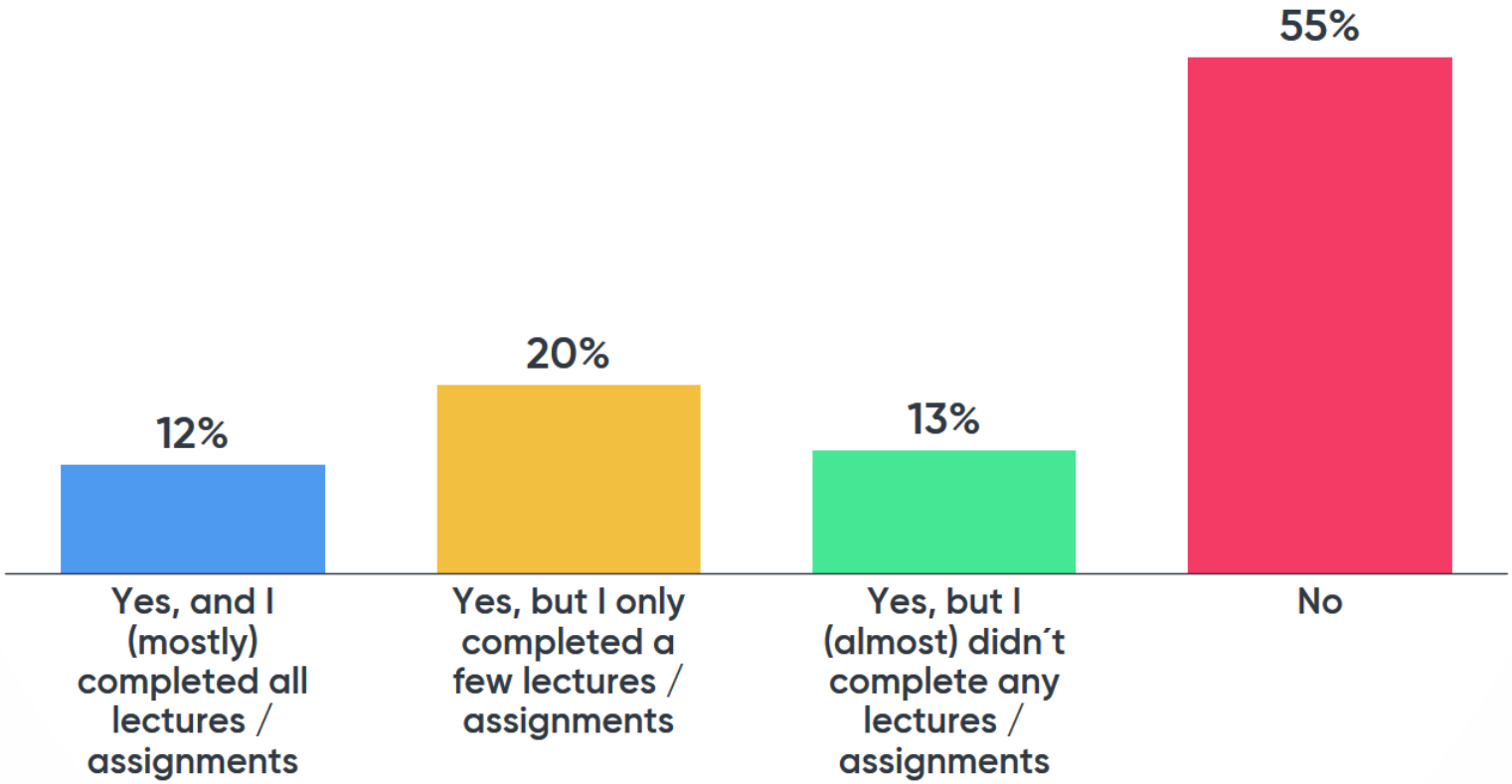
Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

You

Go to **www.menti.com** and use the code **85 70 15**

Did you ever enroll to some online Machine Learning course (e.g on Coursera ...)

Mentimeter



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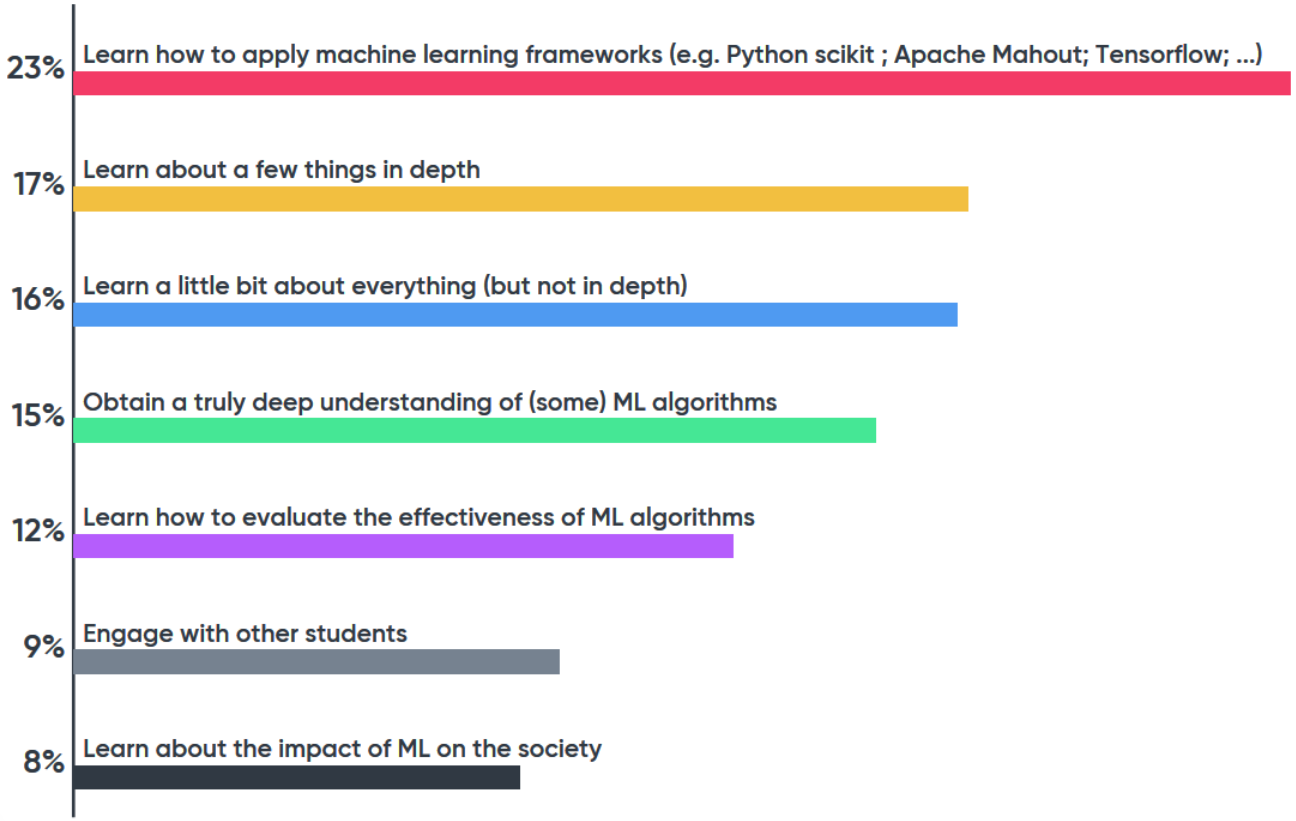
What are your expectations for the module?

Mentimeter



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Knowledge/Skills in ...

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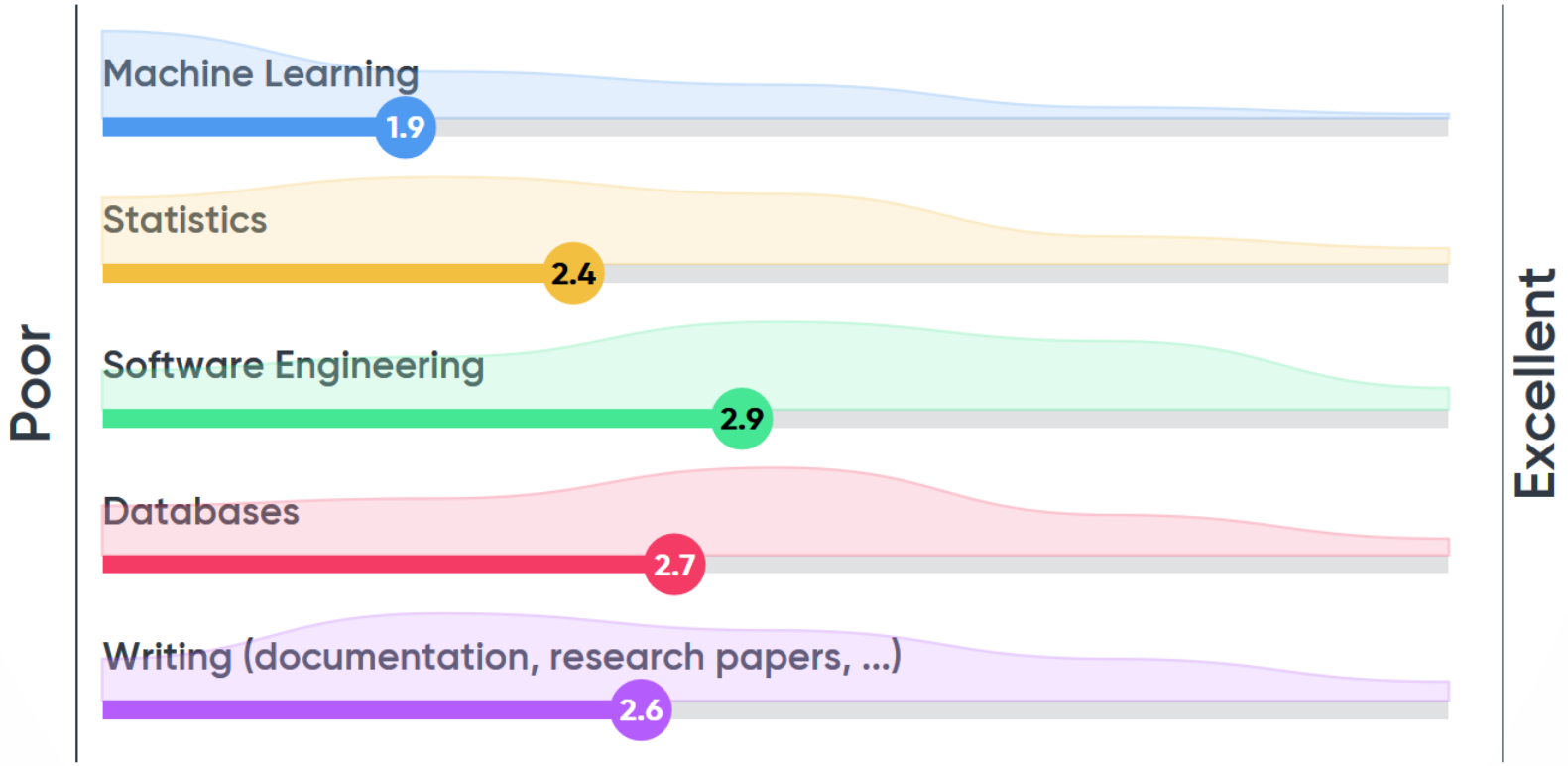

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Knowledge in Programming Languages

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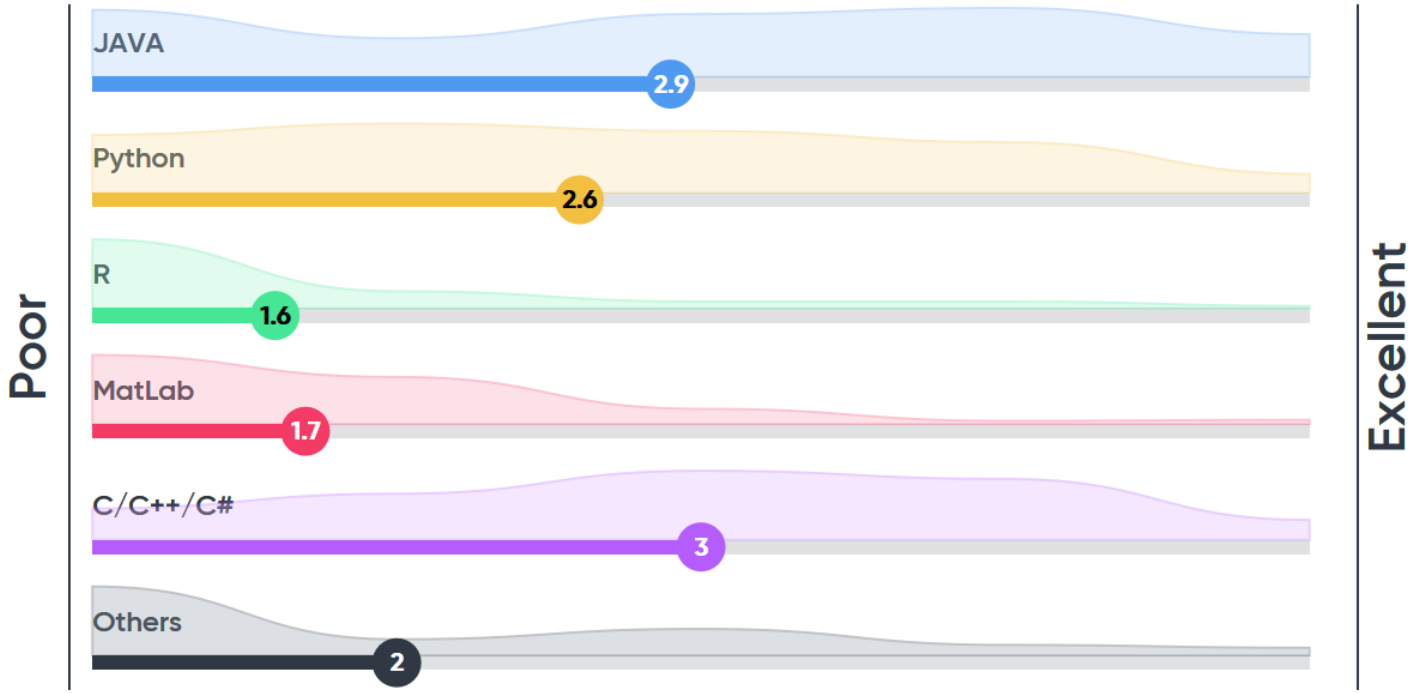

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What careers are attractive to you?

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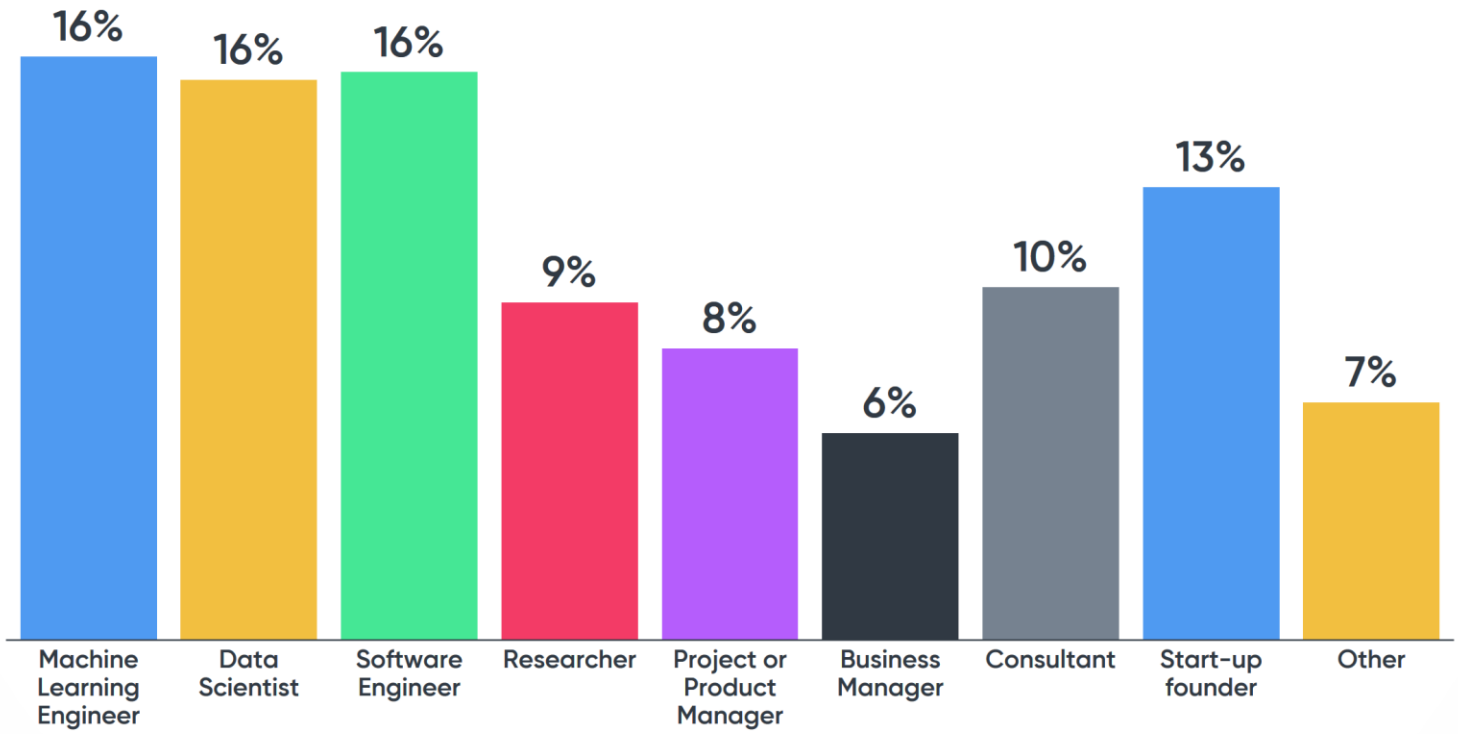

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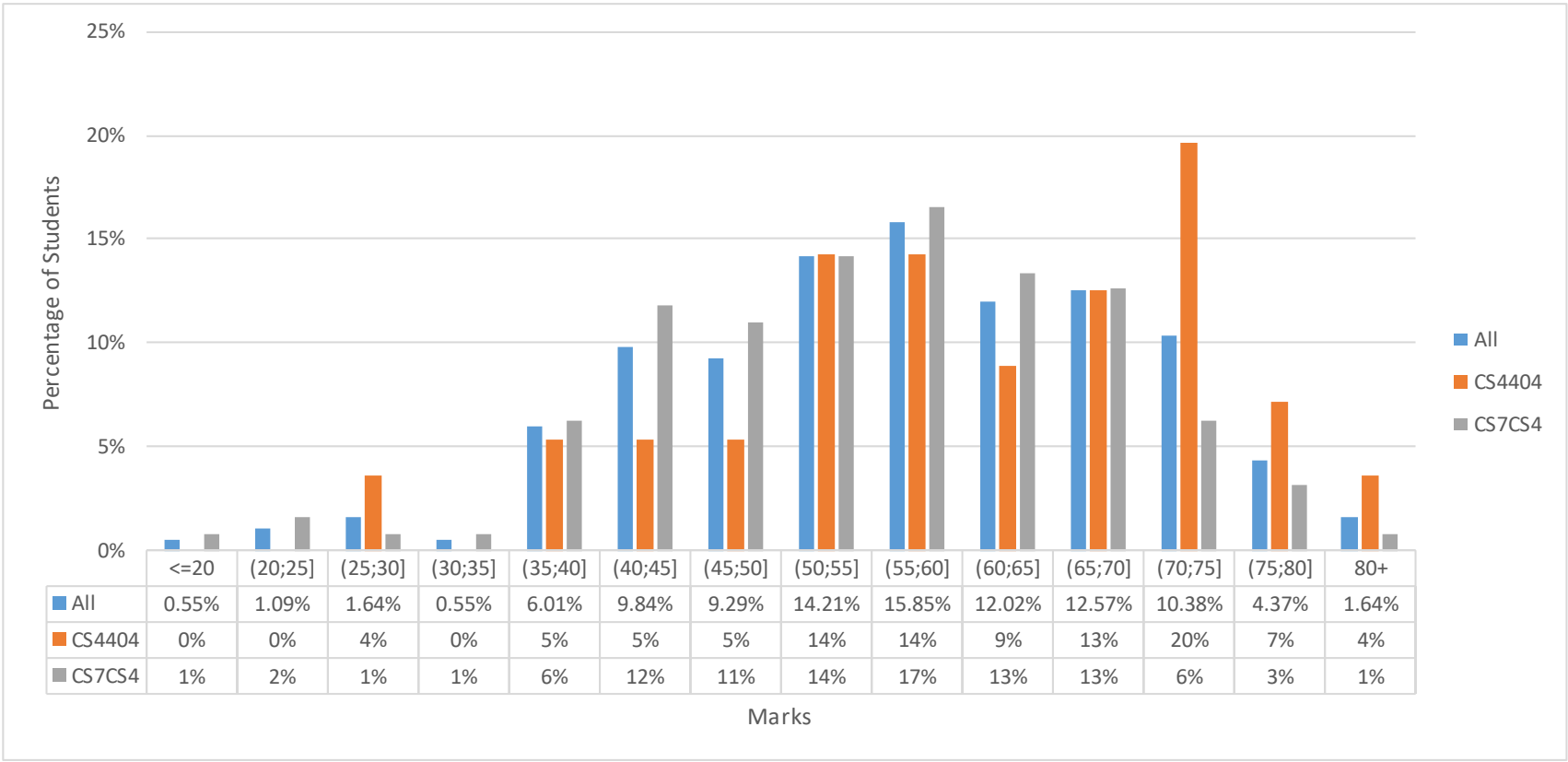
Literature Recommendations

- **Books**
  - Aurélien Géron, ***Hands on Machine Learning with scikit-learn and Tensorflow*** (O'Reilly Media, 2017)
  - Henrik Brink, Joseph Richards, and Mark Fetherolf, ***Real-world machine learning*** (Manning Publications Co., 2016)
  - John Paul Mueller and Luca Massaron, ***Machine Learning for Dummies*** (John Wiley & Sons, 2016)
  - Michael Nielsen, Neural Networks and Deep Learning http://neuralnetworksanddeeplearning.com/
  - Machine Learning Yearning, Andrew Ng, Book In Progress http://www.mlyearning.org/

- **Online Courses**
  - https://www.udemy.com/machinelearning/
  - https://www.coursera.org/learn/machine-learning

- **The World Wide Web**
  - Kaggle
  - KDNuggets
  - Google AI Blog
  - Vaultanalytics https://vaultanalytics.com/ai-applications/
  - O'Reilly AI Newsletter https://www.oreilly.com/ai/newsletter.html
  - TechCrunch

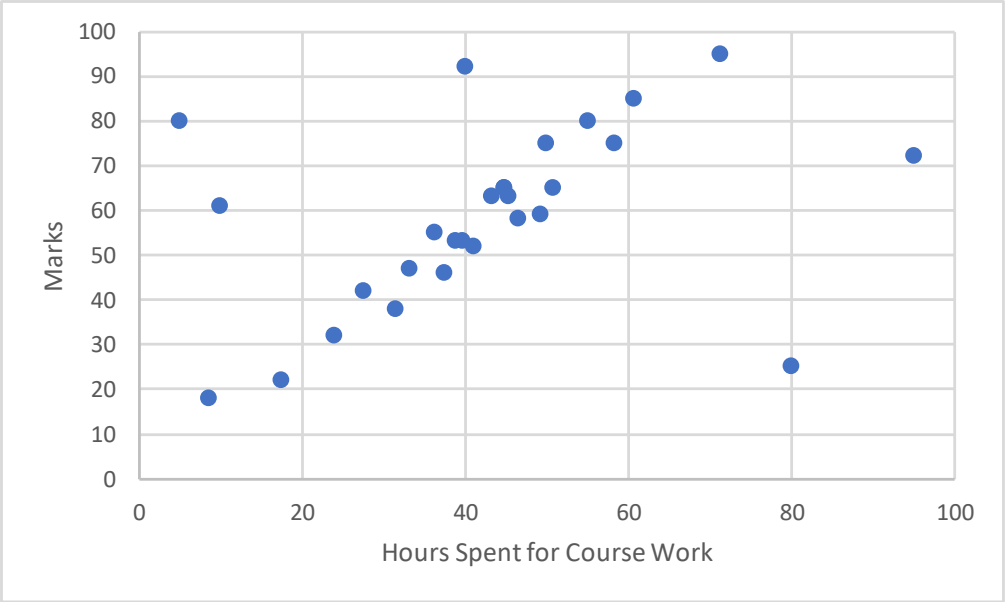
Last Year´s Marks



	<=20	(20;25]	(25;30]	(30;35]	(35;40]	(40;45]	(45;50]	(50;55]	(55;60]	(60;65]	(65;70]	(70;75]	(75;80]	80+
All	0.55%	1.09%	1.64%	0.55%	6.01%	9.84%	9.29%	14.21%	15.85%	12.02%	12.57%	10.38%	4.37%	1.64%
CS4404	0%	0%	4%	0%	5%	5%	5%	14%	14%	9%	13%	20%	7%	4%
CS7CS4	1%	2%	1%	1%	6%	12%	11%	14%	17%	13%	13%	6%	3%	1%

A Machine Learning Problem (Example)

- **A student tells you that she spent 90 hours for the Machine Learning module (course work, exam preperation, …). How many marks do you think she will receive?**
- **Without information difficult to answer**
- **Have a look at her fellow students**
  - x = Time spent
  - y = Achieved marks
- **Now, again: How many marks will she receive? 10, 20, 30 … 90, 100?**



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Thank you