

AK HCI: Intelligent User Interfaces

706.046 (Summer 2018)

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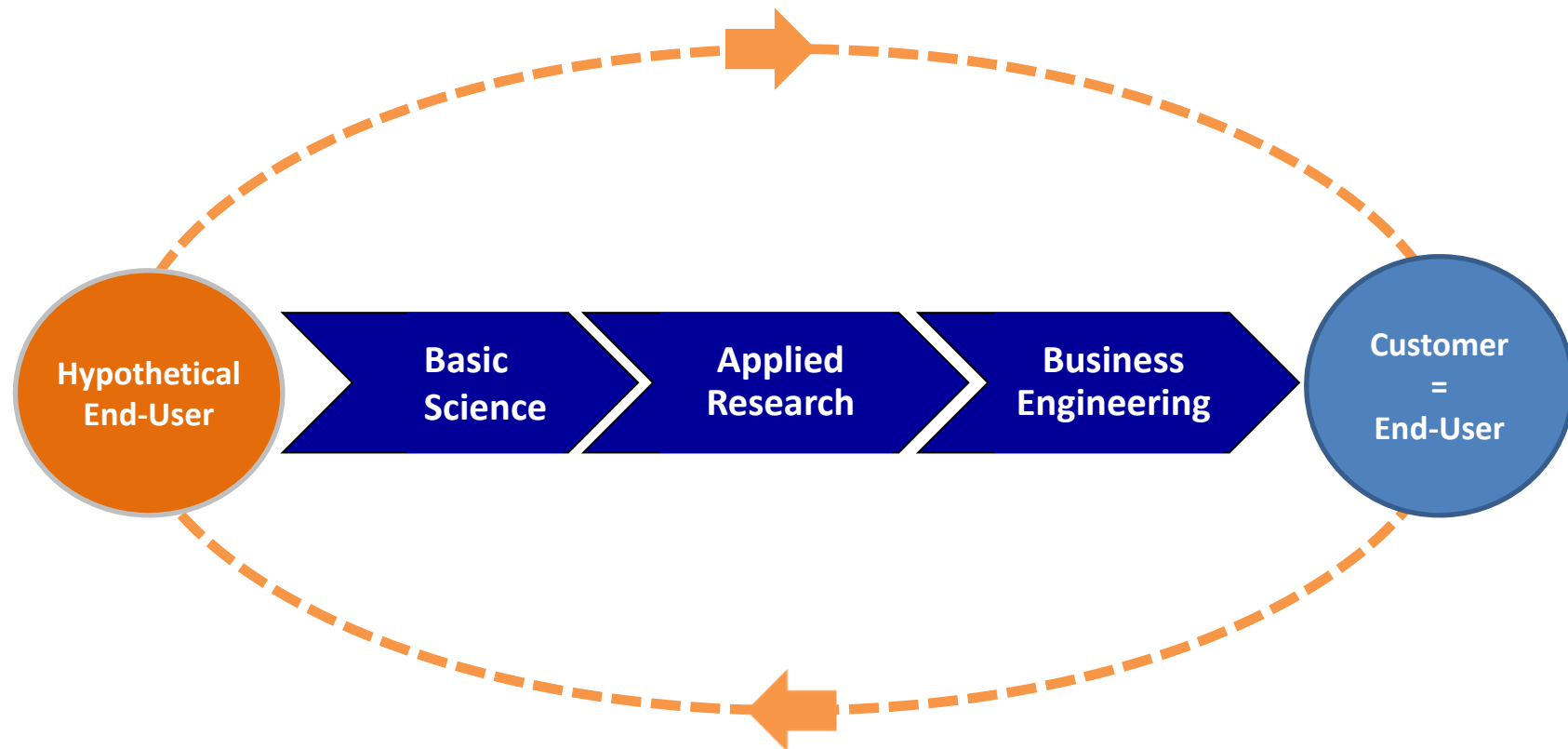
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<https://hci-kdd.org/iui-explainable-ai>





Science is to test crazy ideas –
Engineering is put these ideas
into Business!



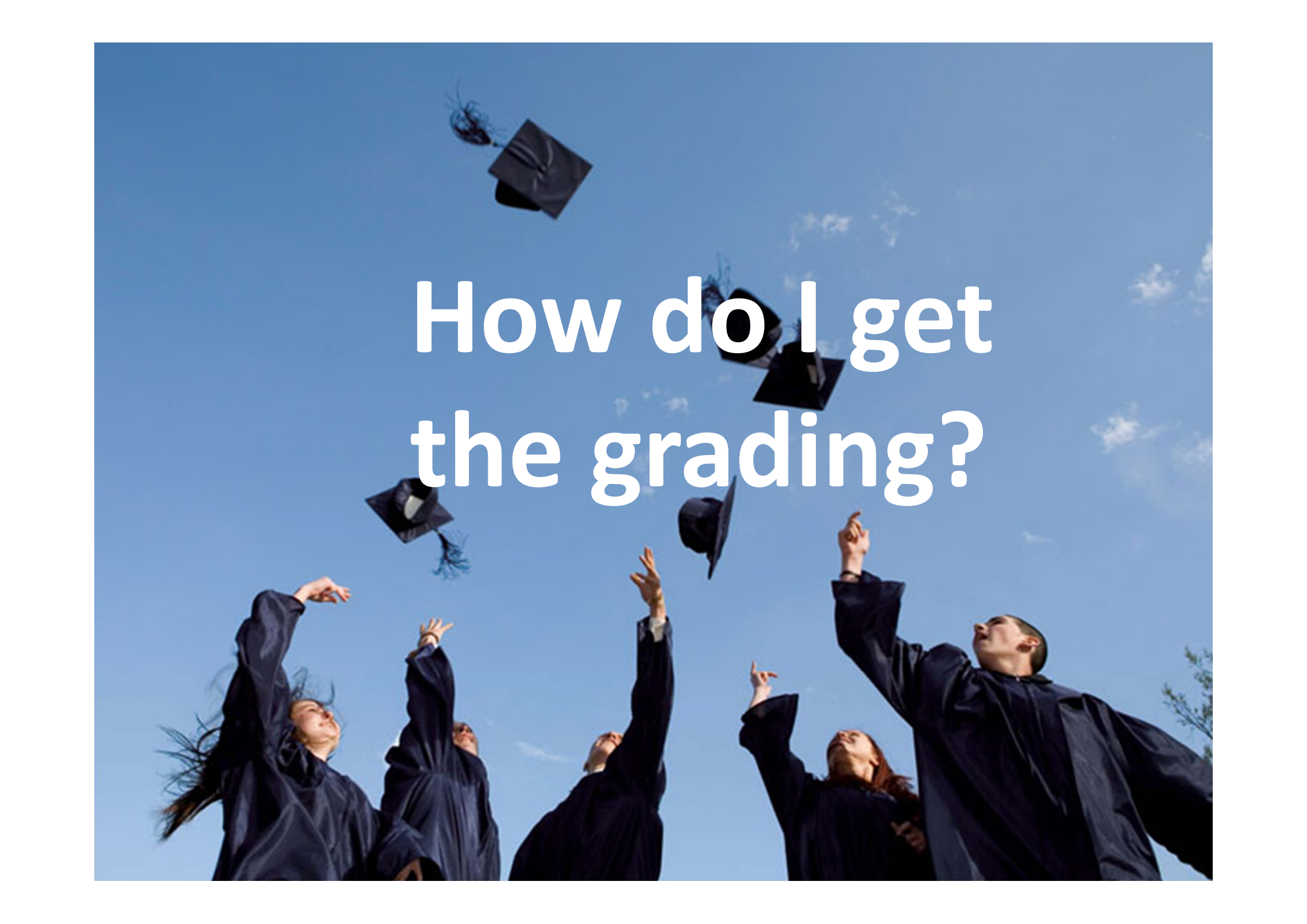


Holzinger, A. 2011. *Successful Management of Research and Development*, Norderstedt, BoD.

The background of the slide is Salvador Dalí's famous 1931 painting, "The Persistence of Memory." It depicts a desolate, rocky coastline under a pale, hazy sky. In the foreground, a large, melting pocket watch lies on a dark, craggy rock. To its left, a small, red, oval-shaped object, possibly a tomato, is covered in dark seeds. In the middle ground, another melting pocket watch is draped over a twisted, leafless branch. A third, smaller melting watch is visible in the distance, resting on a ledge. The painting's surreal imagery of time melting away serves as a metaphor for the fluid and unpredictable nature of a project schedule.

**What is the
2018 schedule?**

DATE	TIME	ROOM	AGENDA
Mo 05.03.2018	14:00 –	IDEG134	01 Introduction and presentation of cool mini-projects by the tutors
Mo 12.03.2018	14:00 –	IDEG134	02 Presenting the mini-project goals by the groups – to ensure mutual understanding
Mo 16.04.2018	14:00 –	IDEG134	03 Progress Meeting – presenting the mini project status
Mo 14.05.2018	14:00 –	IDEG134	04 Progress Report presentation – mid term review
Mo 11.06.2018	14:00 –	IDEG134	05 Mini Conference – final presentation

A low-angle shot of five graduates in dark blue gowns throwing their black mortarboard caps into the air against a clear blue sky with a few wispy clouds. The caps are captured in mid-air at various heights and angles. The graduates are at the bottom of the frame, looking up with their arms raised.

**How do I get
the grading?**

Friday 14 October lecture on variational inference.

Final Project

In the second half of the course, you will complete a project. The ideal outcome of this project would be a paper that could be submitted to a top-tier machine learning conference such as NIPS, ICML, UAI, AISTATS, or KDD. There are different ways to approach this project, which are discussed in a more comprehensive document that is available from the course website under the Files tab. There are four separate components of the project:

- Part 1: (70%):
 - Document your work in a scientific paper
- Introduction and Motivation for Research
- Theoretical Background
- Related Work
- Methods and Materials
- Discussion and Lessons Learned
- Conclusion
- Future Work

- Part 2 (30 %): Project Presentation during the Mini Conference
- Presenting the paper in plenum
- Note: everybody within a group has to present an equal portion of the work – NO SLEEPING
- Discussion
- Mini-Conference Style

BEGIN·of·Review¶

¶
Title·of·the·Paper:¶

¶
Please·describe·briefly·with·your·own·words·what·this·paper·is·about:¶

¶
This·paper·reports·on·x·...·(do·not·evaluate·at·this·point,·just·describe)¶

¶
1)·Originality:·Does·the·paper·contain·significant·content·to·justify·publication?·What·are·novel·aspects?·Did·you·check·for·plagiarism,·e.g.·with·a·quick·Google·search?¶

¶
Novel·aspects·include·the·topic·x·...¶

¶
2)·Related·Work:·Is·there·enough·background·and·relevant·related·work?·Are·any·relevant·references·missing?·Please·provide·recommendations.¶

¶
The·following·important·related·papers·are·missing·...¶

¶
3)·Methodology:·Is·the·paper's·argument·built·on·an·appropriate·base·of·theory·and·concepts?·Are·the·methods·used·appropriately·described?¶

¶
The·methods·x·are·...¶

¶
4)·Results:·Are·the·results·presented·clearly·and·appropriately?·Do·the·conclusions·adequately·tie·together·the·other·elements·of·the·paper?¶

¶
The·results·are·...¶

¶
5)·Qualitative·Evaluation:·Is·the·paper·well·written?·Is·it·clear,·readable·and·comprehensive?·Sentence·structure,·acronym·explanation,·typos,·etc.·ok?¶

¶
The·paper·is·...¶

¶
6)·Quantitative·Evaluation:·Given·that·the·worst·paper·you·have·ever·read·receives·0·and·the·best·paper·ever·receives·100·points--how·many·points·would·you·assign·to·this·paper:·XX·(0·...·100)¶

01 What is the



approach?

- Machine Learning is a very practical field – at the core is **algorithm development** – however, successful machine learning needs a concerted effort of various fields ...



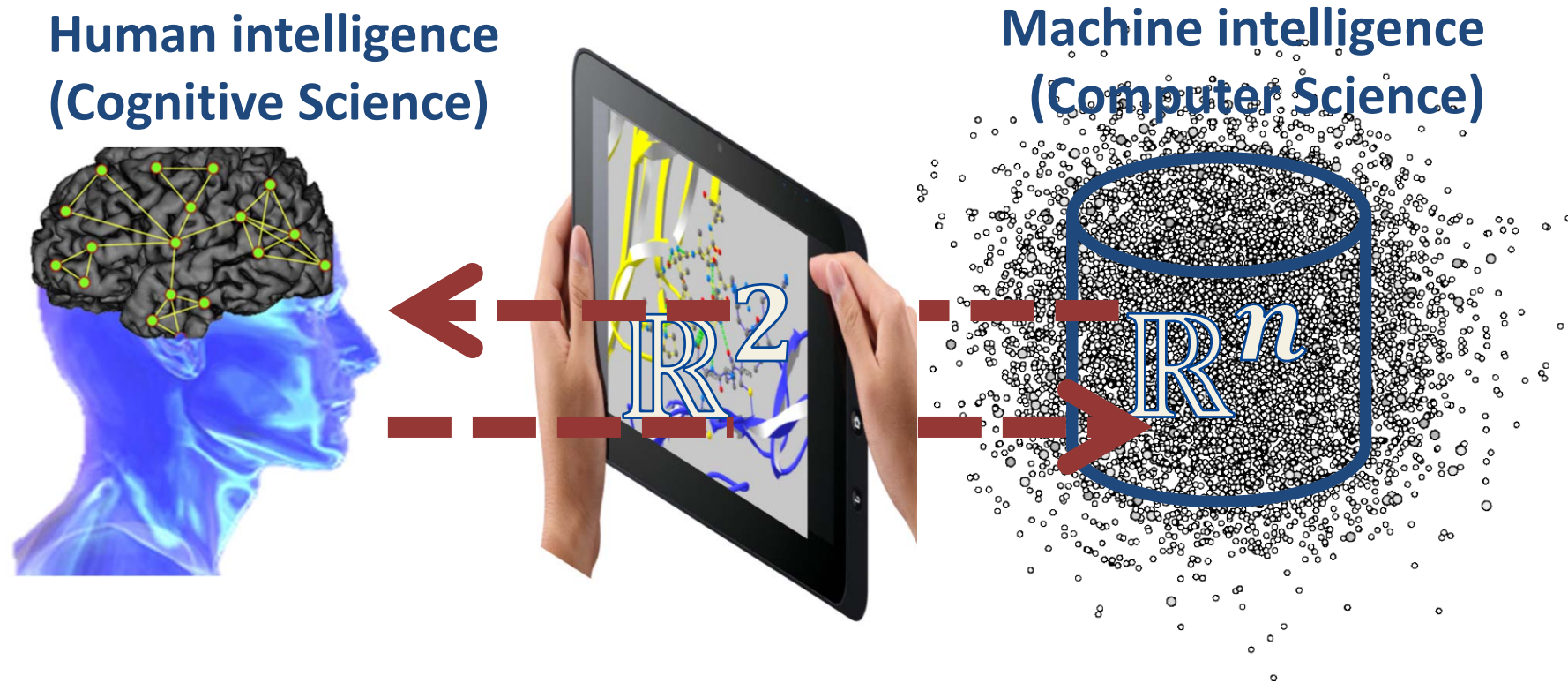
MAchine Learning & Knowledge Extraction MAKE

(Safety) 4 - Privacy, Data Protection, Safety & Security



(Space and Time) 5 - Network, 6-Topology, 7-Entropy

Andreas Holzinger 2017. Introduction to Machine Learning and Knowledge Extraction (MAKE).
Machine Learning and Knowledge Extraction, 1, (1), 1-20, doi:10.3390/make1010001.



Holzinger, A. (2013). Human–Computer Interaction & Knowledge Discovery (HCI-KDD): What is the benefit of bringing those two fields to work together? In: Lecture Notes in Computer Science 8127 (pp. 319-328)

- **Cognitive Science → human intelligence**

- Study the principles of *human learning* to understand biological intelligence

- **Human-Computer Interaction → the bridge**

- Interacting with algorithms that learn shall enhance user friendliness and let concentrate on problem solving - Opening the “black-box” to a “glass-box”

- **Computer Science → computational intelligence**

- Study the principles of *machine learning* to understand artificial intelligence

- 1) **learn** from prior data
- 2) **extract** knowledge
- 2) **generalize**, i.e. guessing where a probability mass function concentrates
- 4) fight the curse of **dimensionality**
- 5) **disentangle** underlying explanatory factors of data, i.e.
- 6) **understand** the data in the **context** of an application domain

“Solve intelligence – then solve everything else”



<https://youtu.be/XAbLn66iHcQ?t=1h28m54s>

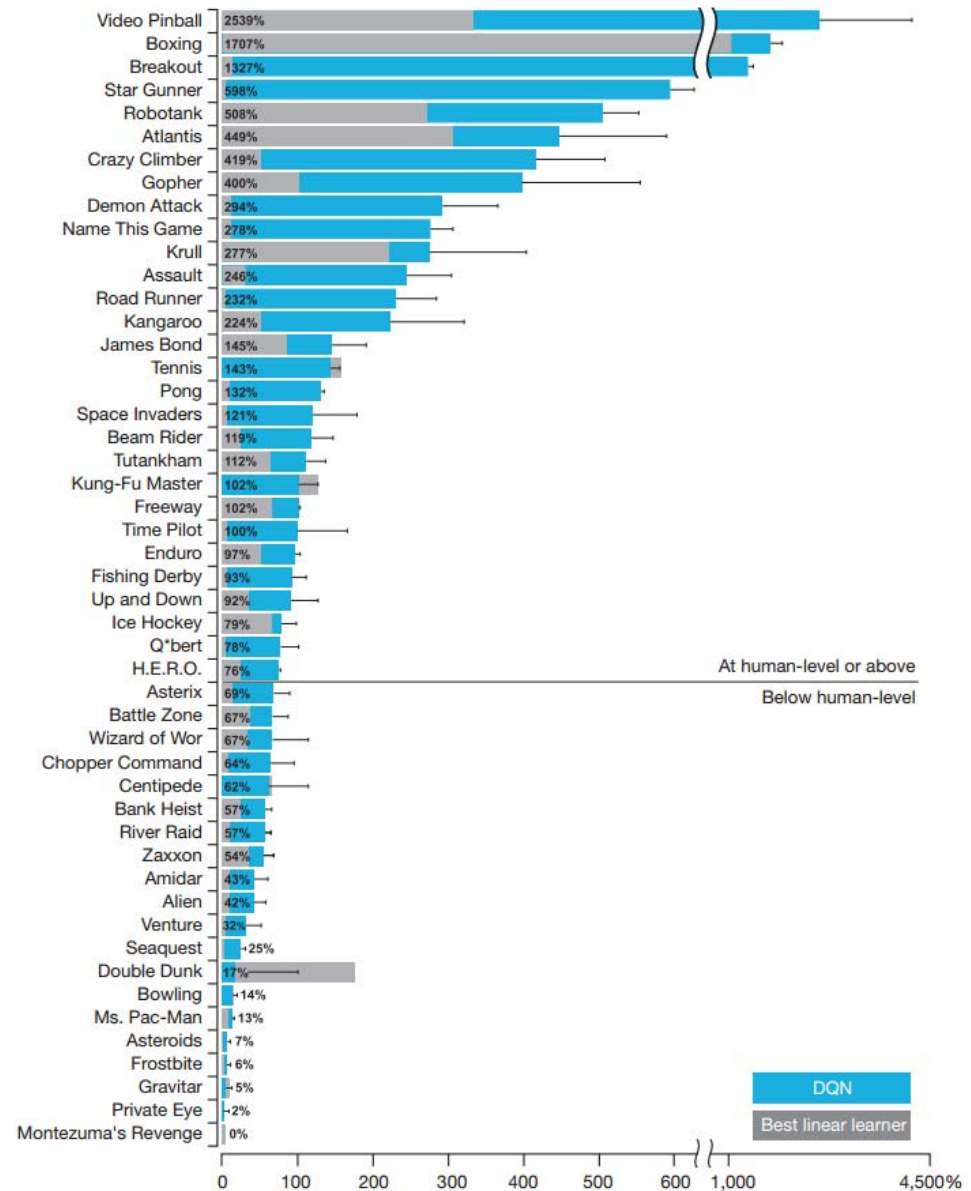
Demis Hassabis, 22 May 2015

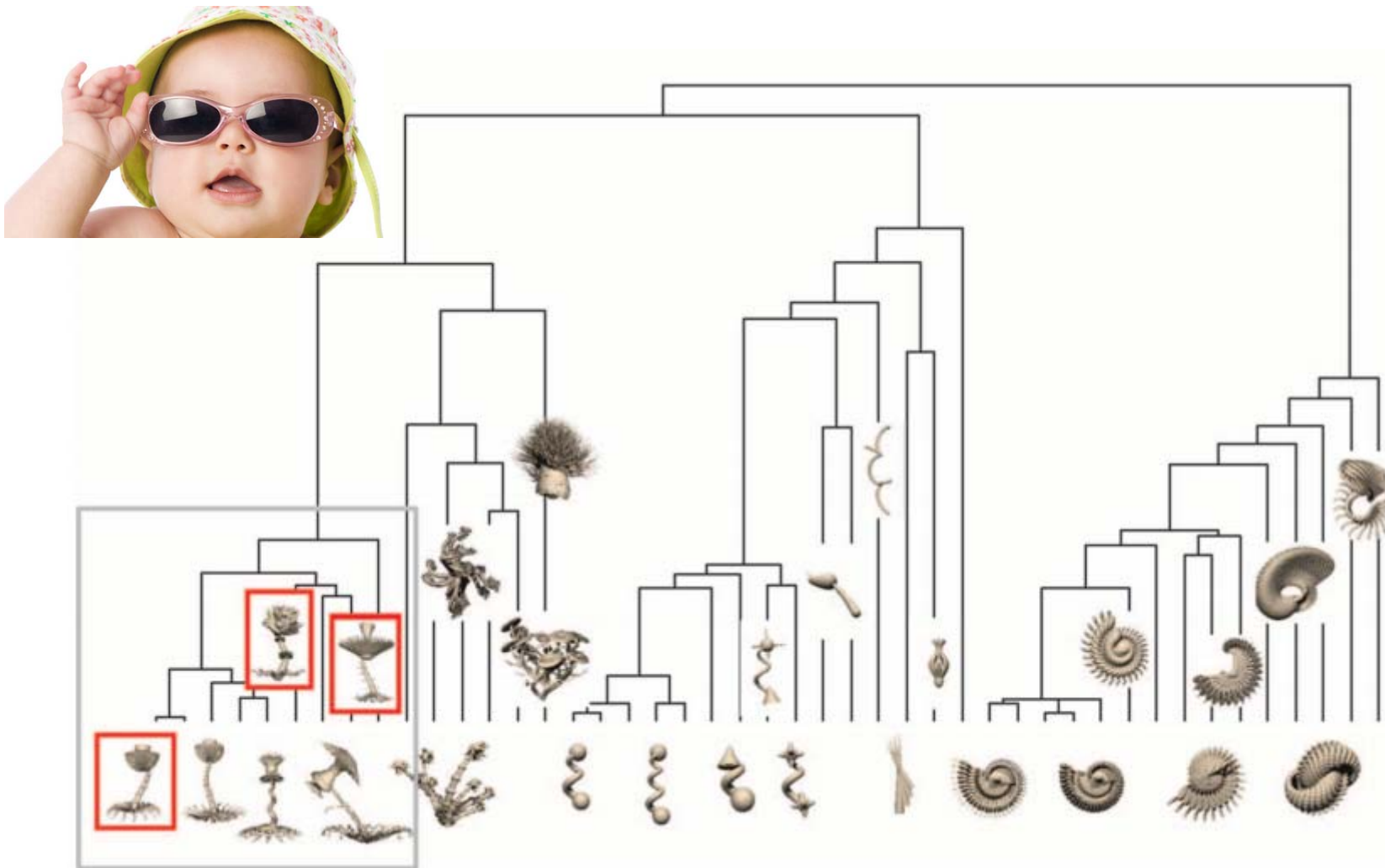
The Royal Society,
Future Directions of Machine Learning Part 2



Now, compare your best Machine Learning algorithm with a seven year old child ...

Mnih, V., Kavukcuoglu, K., Silver, D., Rusu, A. A., Veness, J., Bellemare, M. G., Graves, A., Riedmiller, M., Fidjeland, A. K., Ostrovski, G., Petersen, S., Beattie, C., Sadik, A., Antonoglou, I., King, H., Kumaran, D., Wierstra, D., Legg, S. & Hassabis, D. 2015. Human-level control through deep reinforcement learning. Nature, 518, (7540), 529-533, doi:10.1038/nature14236





Tenenbaum, J. B., Kemp, C., Griffiths, T. L. & Goodman, N. D. 2011. How to grow a mind: Statistics, structure, and abstraction. *Science*, 331, (6022), 1279-1285, doi:10.1126/science.1192788.

iML

- Sometimes we do **not** have “big data”, where aML-algorithms benefit.
- Sometimes we have
 - **Small amount of data sets**
 - **Rare Events – no training samples**
 - **NP-hard problems, e.g.**
 - Subspace Clustering,
 - Protein-Folding,
 - k-Anonymization,
 - Category Discovery, etc. etc....

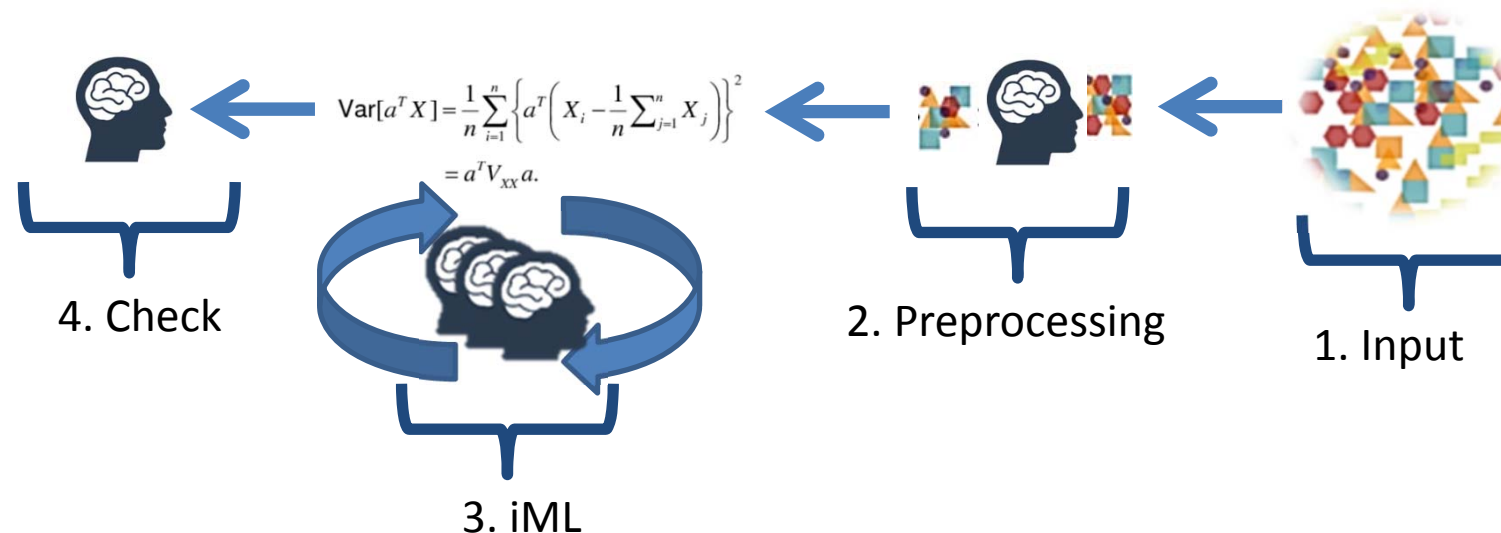
**Sometimes we
(still) need a
human-in-the-loop**







D) Interactive Machine Learning: Human is seen as an agent involved in the actual learning phase, step-by-step influencing measures such as distance, cost functions ...

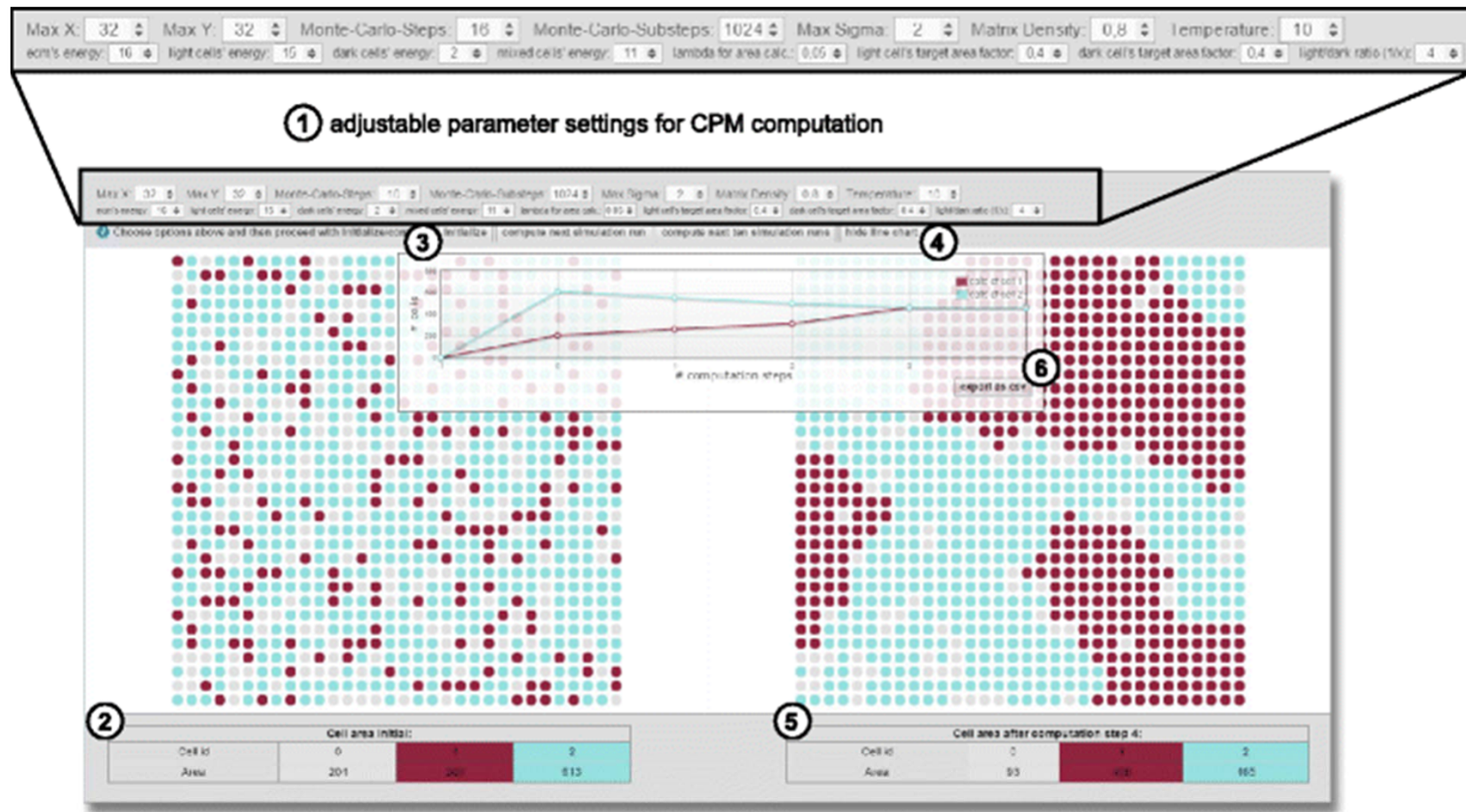


Constraints of humans: Robustness, subjectivity, transfer?
Open Questions: Evaluation, replicability, ...

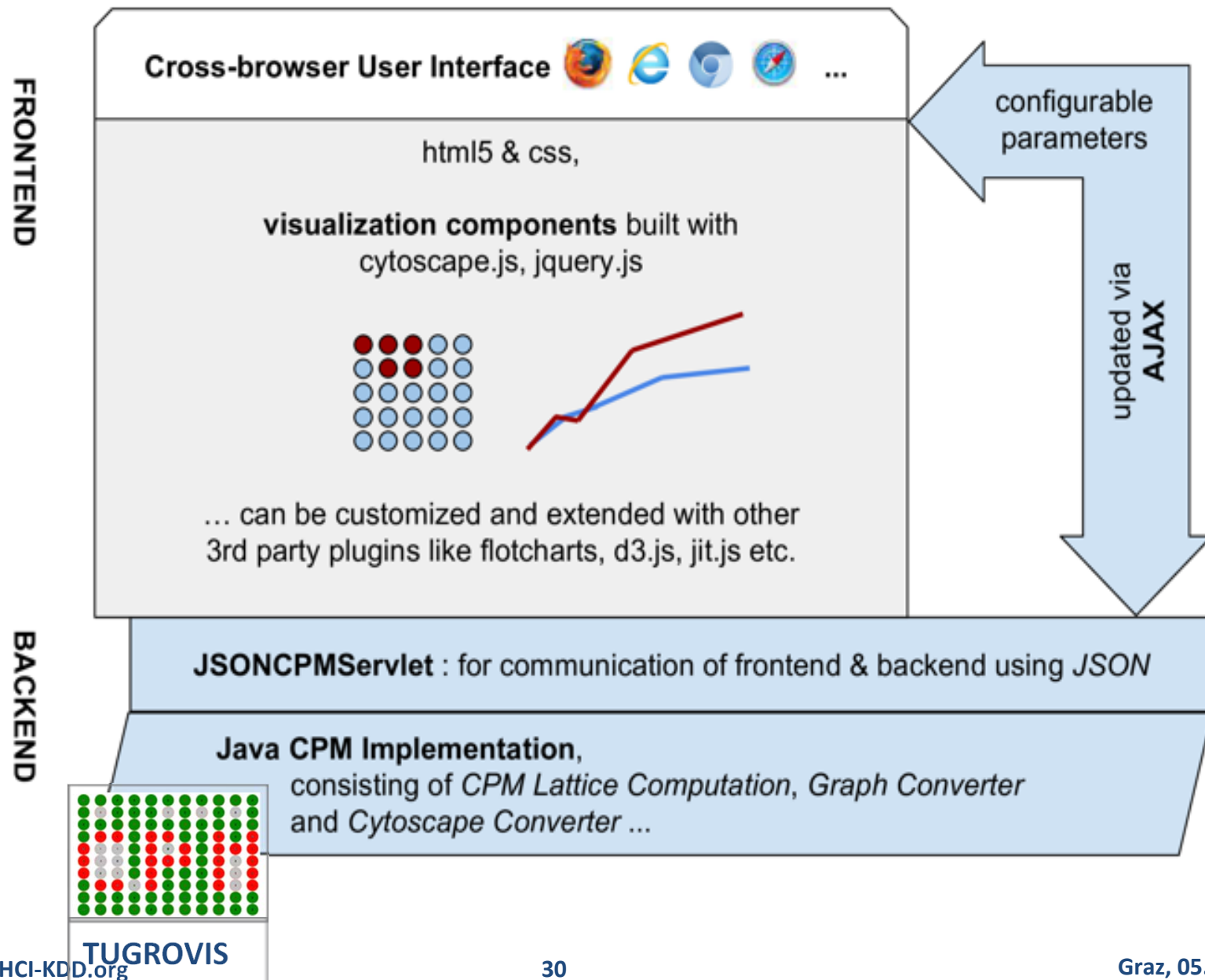
Holzinger, A. 2016. Interactive Machine Learning for Health Informatics: When do we need the human-in-the-loop? Brain Informatics (BRIN), 3, (2), 119-131, doi:10.1007/s40708-016-0042-6.

Mini Projects from TUGroSIM project

Jeanquartier, F., Jean-Quartier, C., Cemernek, D. & Holzinger, A. 2016. In silico modeling for tumor growth visualization. BMC Systems Biology, 10, (1), 1-15, doi:10.1186/s12918-016-0318-8.



Jeanquartier, F., Jean-Quartier, C., Cemernek, D. & Holzinger, A.
2016. **In silico modeling for tumor growth visualization**. BMC
Systems Biology, 10, (1), 1-15, doi:10.1186/s12918-016-0318-8.



- If interested please contact:
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- c.jeanquartier@hci-kdd.org

- The “best” is the enemy of the “good” – whenever you try to be “perfect” – there is the danger that you finalize nothing*) ...”

*) zero, nada, null



François-Marie Arouet (1694 – 1778)
known as “Voltaire”



Thank you!