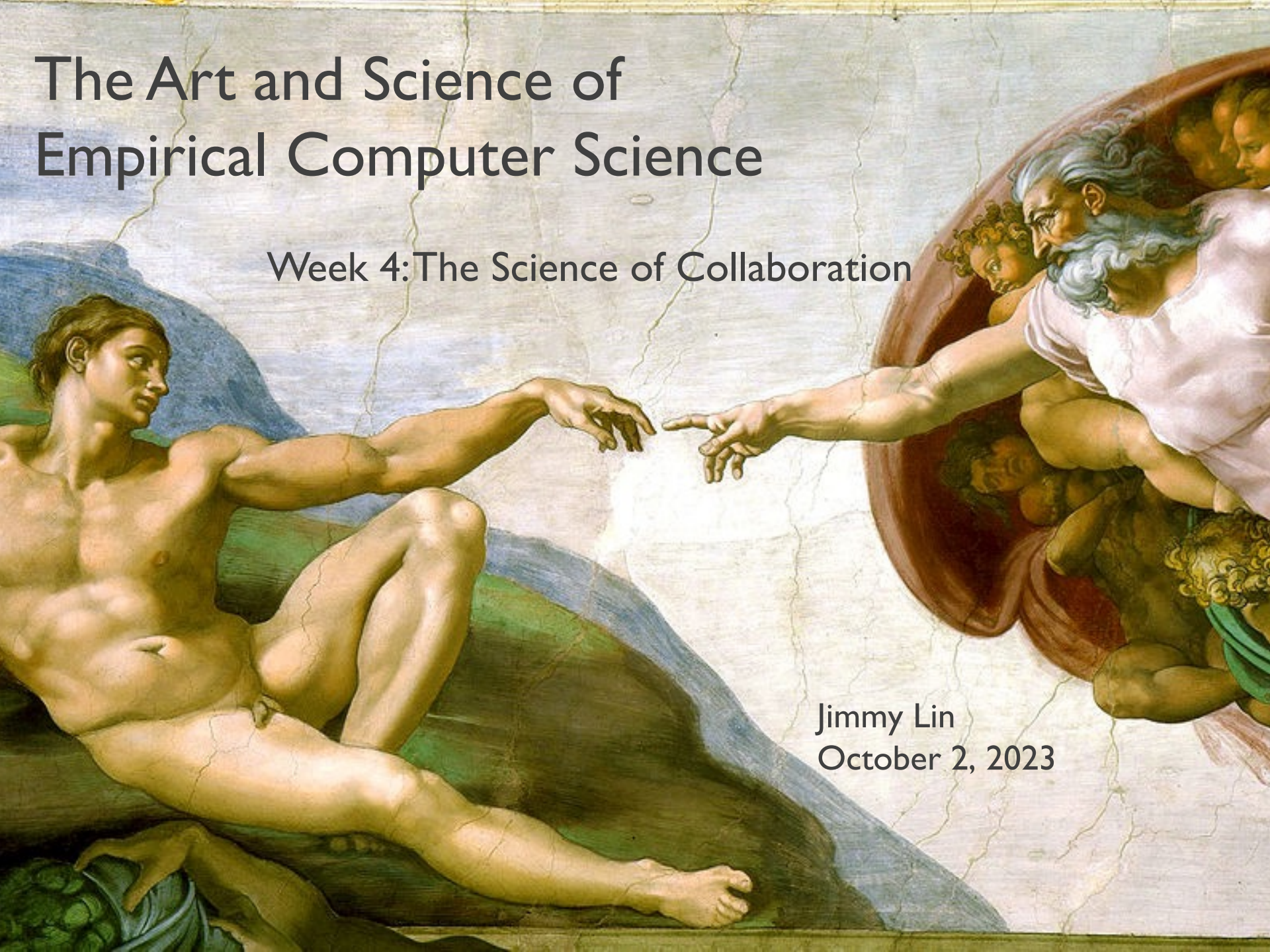


The Art and Science of Empirical Computer Science

Week 4: The Science of Collaboration

Jimmy Lin
October 2, 2023



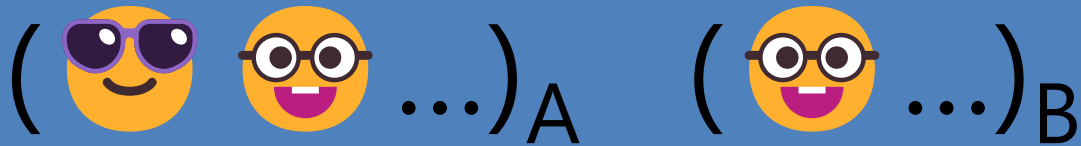
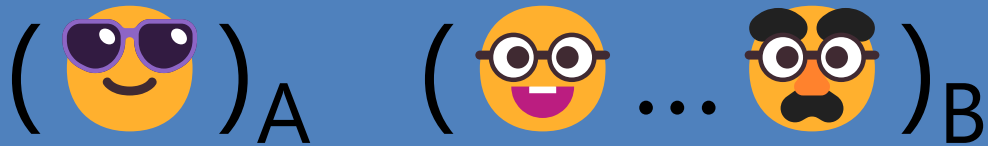
Computational Artifacts

Position A: Early-stage researchers should do the minimal in open-sourcing computational artifacts that arise from their work. Doing anything more than the community norm is a waste of time and effort that could be better spent writing more papers.

Position B: Early-stage researchers should actively promote the adoption of computational artifacts that arise from their work, for example, contributing to popular open-source libraries. Even if this requires a lot of time (e.g., refactoring code into a production-ready state), such efforts are worthwhile.

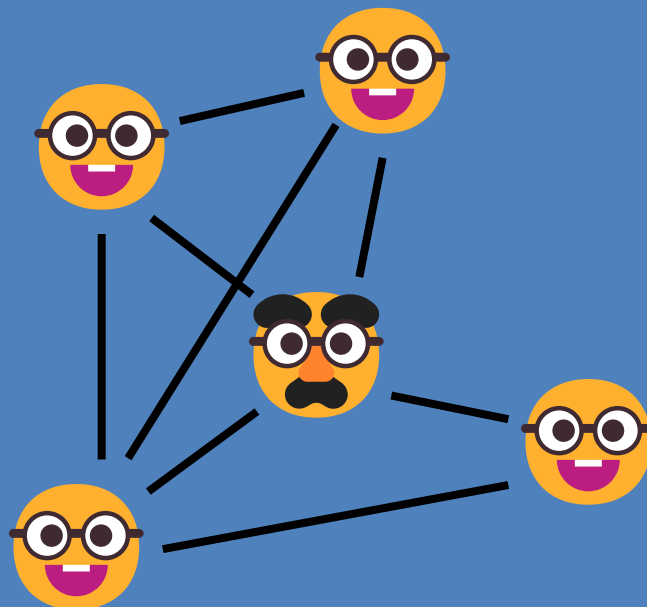
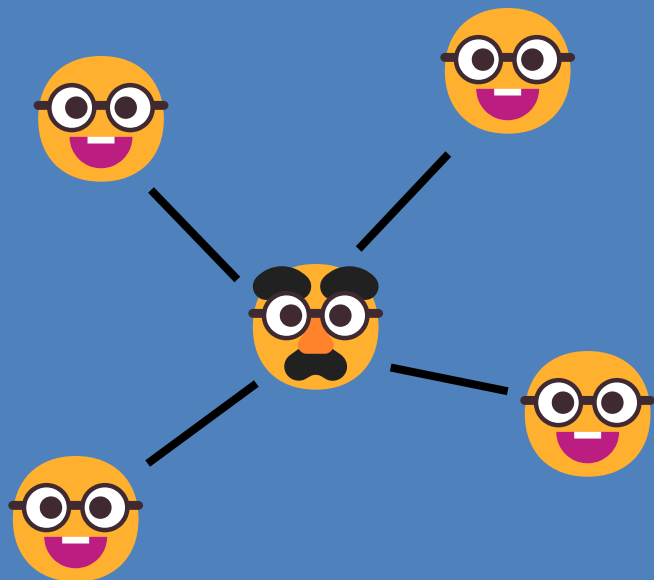
Let's debate!

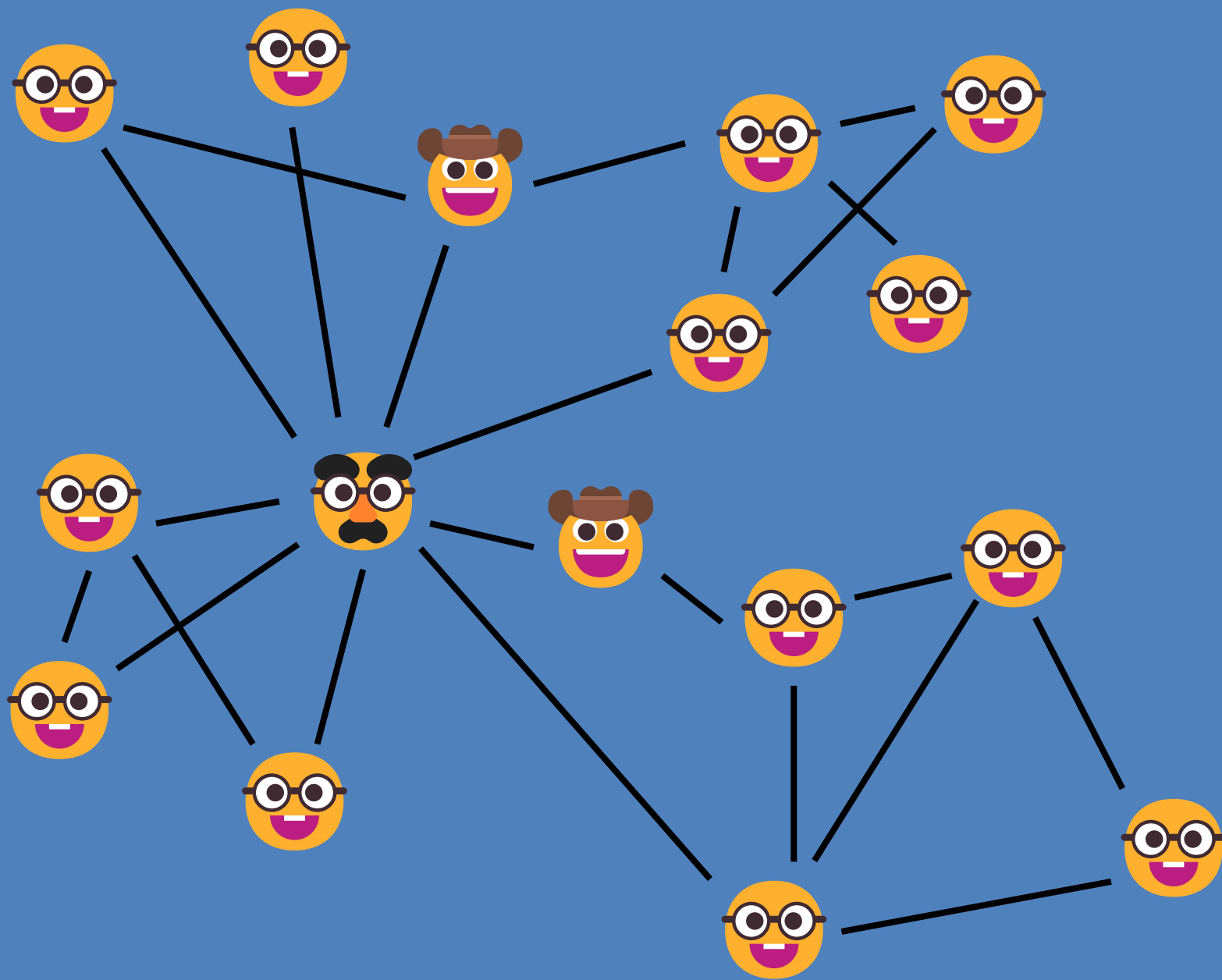


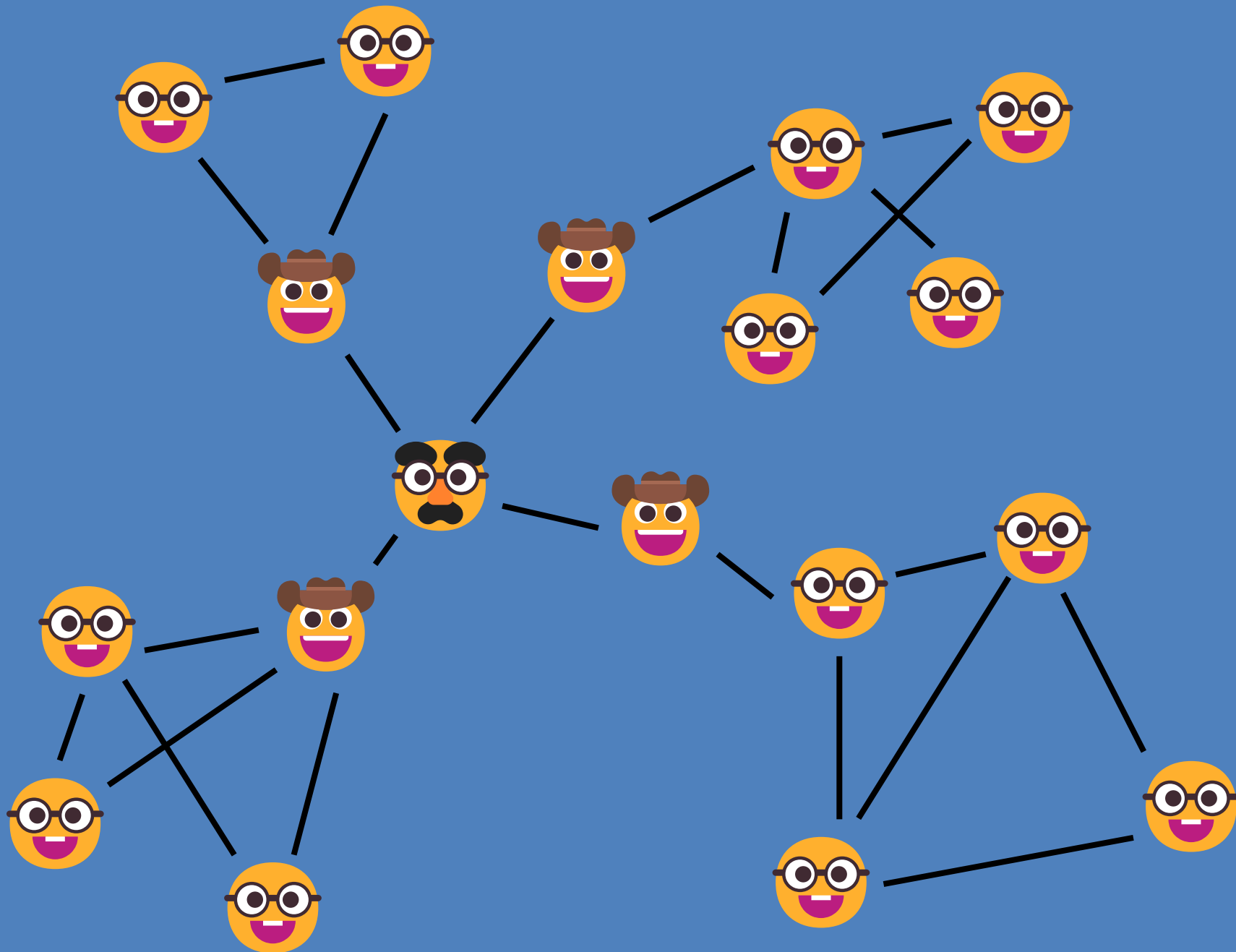




Same organization?
Industry vs. Academia?
Experience?
Complementary?







How do teams *really* form?
What should you do?

tl;dr – “lead or be led”

Shockley's Model

$$N \sim p_1 p_2 p_3 p_4 p_5 p_6 p_7 p_8$$

F₁. Identify a good problem

F₂. Make progress with it

F₃. Recognize a worthwhile result

F₄. Decide when to stop the research and start writing up the results

F₅. Write adequately

F₆. Profit constructively from criticism

F₇. Show determination to submit the paper for publication

F₈. Make changes if required by the journal or the referees

tl;dr – my advice:

Seek homogeneity to share workload

Seek complementarity for everything else

Important: let your advisor know!

“The Science of Science”, Part II

The Science of Collaboration

Chapter 12: Small and Large Teams

Discussion Points

Why are teams growing in size?

Top-down vs. Bottom-up

Who determines what research gets done?

“The Science of Science”, Part II

The Science of Collaboration

Chapter 13: Scientific Credit
Chapter 14: Credit Allocation

Discussion Points

Normative vs. Positive
Understanding norms
Practical advice

Who gets credit?
Who *should* get credit?
Who *actually* gets credit?

Is it fair?

Generation of Nonclassical Motional States of a Trapped Atom

D. M. Meekhof, C. Monroe, B. E. King, W. M. Itano, and D. J. Wineland

Time and Frequency Division, National Institute of Standards and Technology, Boulder, Colorado 80303-3328**Three-Dimensional Viscous Confinement and Cooling of Atoms by Resonance Radiation Pressure**

Steven Chu, L. Hollberg, J. E. Bjorkholm, Alex Cable, and A. Ashkin

AT&T Bell Laboratories, Holmdel, New Jersey 07733**Giant Magnetoresistance of (001) Fe/(001) Cr Magnetic Superlattices**M. N. Baibich, ^(a) J. M. Broto, A. Fert, F. Nguyen Van Dau, and F. Petroff*Laboratoire de Physique des Solides, Université Paris-Sud, F-91405 Orsay, France*

P. Eitenne, G. Creuzet, A. Friederich, and J. Chazelas

Laboratoire Central de Recherches, Thomson CSF, B.P. 10, F-91401 Orsay, France

Figure 2.6.1 **Who gets the Nobel?** (A) The last author, David J. Wineland was awarded the 2012 Nobel Prize in Physics for his contribution to quantum computing. (B) Steven Chu, the first author, won the 1997 Nobel in Physics for the paper focusing on the cooling and trapping of atoms with laser light. (C) In 2007, Albert Fert, the middle author of the paper, received the Nobel Prize in Physics for the discovery of the giant magnetoresistance effect (GMR). All three examples are prize-winning papers published in the same journal, *Physical Review Letters*, demonstrating the ambiguity of allocating credit by simply reading the byline of a paper.

AlphaFold developers win US\$3-million Breakthrough Prize

DeepMind's system for predicting the 3D structure of proteins is among five recipients of science's most lucrative awards.

[Zeeya Merali](#)



Demis Hassabis (left) and John Jumper (right) from DeepMind developed AlphaFold, an AI that can predict the structure of proteins. Credit: Breakthrough Prize

The researchers behind the AlphaFold artificial-intelligence (AI) system have won one of this year's US\$3-million Breakthrough prizes — the most lucrative awards in science. Demis Hassabis and John Jumper, both at DeepMind in London, were recognized for creating the tool that has predicted the 3D structures of almost every known protein on the planet.



Dan Roy
@roydanroy

...

I was curious how AlphaFold was honored by the breakthrough prize to two individuals. I went back to one of the Nature papers to look at the author contributions. Curious what people see that could justify two people being named.

9:35 PM · Sep 23, 2022 · Twitter Web App

<https://twitter.com/roydanroy/status/1573486328502689827>

Improved protein structure prediction using potentials from deep learning

[Andrew W. Senior](#) , [Richard Evans](#), [John Jumper](#), [James Kirkpatrick](#), [Laurent Sifre](#), [Tim Green](#), [Chongli Qin](#), [Augustin Žídek](#), [Alexander W. R. Nelson](#), [Alex Bridgland](#), [Hugo Penedones](#), [Stig Petersen](#), [Karen Simonyan](#), [Steve Crossan](#), [Pushmeet Kohli](#), [David T. Jones](#), [David Silver](#), [Koray Kavukcuoglu](#) & [Demis Hassabis](#)

[Nature](#) **577**, 706–710 (2020) | [Cite this article](#)

Contributions

R.E., J.J., J.K., L.S., A.W.S., C.Q., T.G., A.Ž., A.B., H.P. and K.S. designed and built the AlphaFold system with advice from D.S., K.K. and D.H. D.T.J. provided advice and guidance on protein structure prediction methodology. S.P. contributed to software engineering. S.C., A.W.R.N., K.K. and D.H. managed the project. J.K., A.W.S., T.G., A.Ž., A.B., R.E., P.K. and J.J. analysed the CASP results for the paper. A.W.S. and J.K. wrote the paper with contributions from J.J., R.E., L.S., T.G., A.B., A.Ž., D.T.J., P.K., K.K. and D.H. A.W.S. led the team.

Corresponding author

Correspondence to [Andrew W. Senior](#).

THE AUTHOR LIST: GIVING CREDIT WHERE CREDIT IS DUE

The first author
Senior grad student on the project. Made the figures.

The third author
First year student who actually did the experiments, performed the analysis and wrote the whole paper. Thinks being third author is "fair".

The second-to-last author
Ambitious assistant professor or post-doc who instigated the paper.

Michaels, C., Lee, E. F., Sap, P. S., Nichols, S. T., Oliveira, L., Smith, B. S.

The second author
Grad student in the lab that has nothing to do with this project, but was included because he/she hung around the group meetings (usually for the food).

The middle authors
Author names nobody really reads. Reserved for undergrads and technical staff.

The last author
The head honcho. Hasn't even read the paper but, hey, he/she got the funding, and their famous name will get the paper accepted.

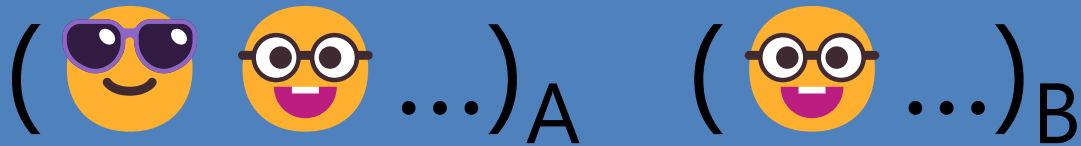
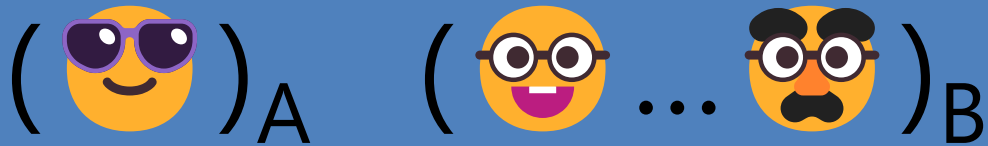
Ordering of Authors

Field-specific norms (alphabetical vs. contribution-based)

You (as a student) have very limited control

Important first step: understand what the norms are!





Authorship Contribution Statements

Thoughts?

Practical Advice

Determine coauthorship (and ordering) early.

Don't forget to communicate with non-coauthors.

(Personal view) Be generous with the middle author positions.

Who actually gets the credit?

For the most part... your advisor 😞

Why?

How can you overcome it?

That's all for this week!