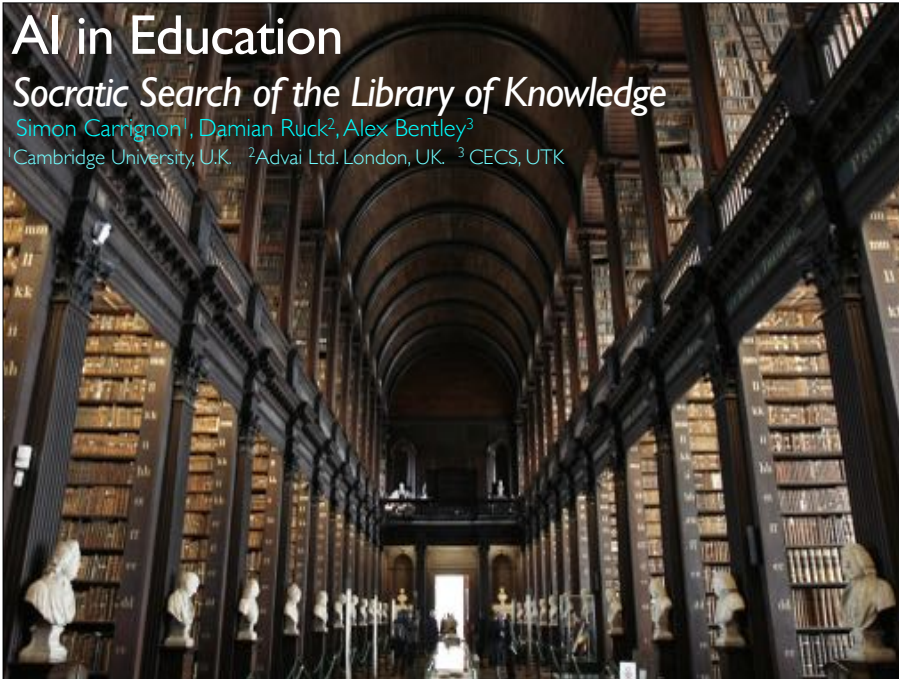


AI in Education

Socratic Search of the Library of Knowledge

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A reminder that AI breakthrough was inspired by *human* learning

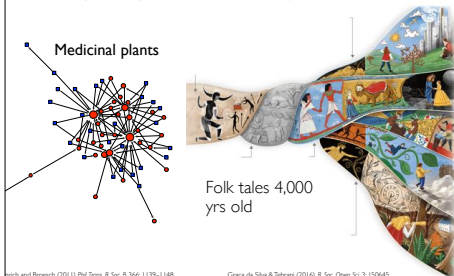


See, e.g. Lake, B.M. et al. (2017) Building machines that learn and think like people. *Behavioral and Brain Sciences* 40, E253.

For thousands of years, humans adapt by learning from experts



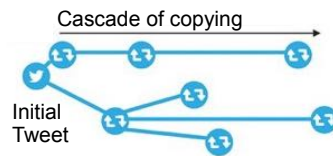
Medicinal plant expert, Yasawa Islands, Fiji



Smith and Brown (2011) *Phil Trans. R. Soc. B* 366, 1139–1148.

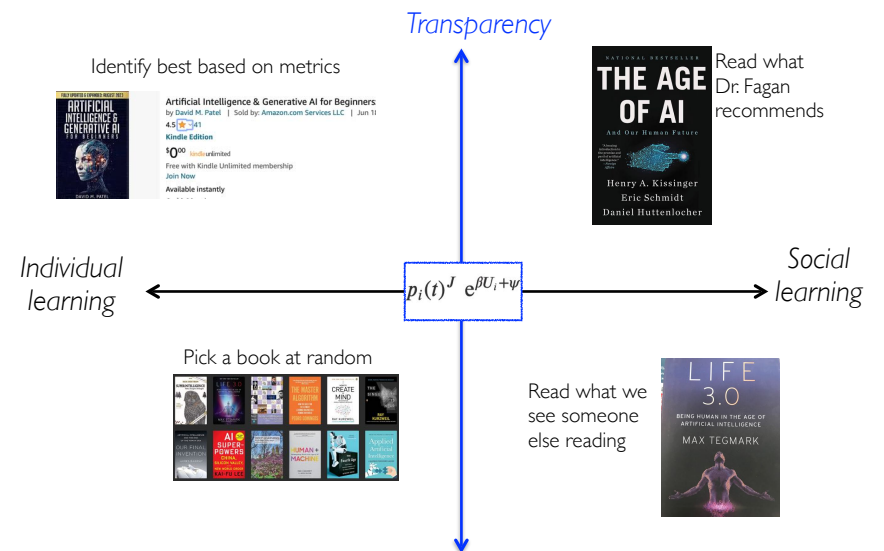
Graça da Silva & Telvan (2016) *R. Soc. Open Sci.* 3, 150645.

Lately, we often copy randomly



Vassighi et al. (2018) *Science* 359:1146–1151; also Lazer et al. (2018) *Science* 2018:359:1094–1096

Two dimensions of learning



Bentley, O'Brien, Bock et al. (2014) *Behavioral Brain Sciences* 37, 63–119.

Chat GPT: An expert on python coding

"How can I add a moving average to a python plot?"

"How would we add a 95% C.I around the average to that plot?"

```
global_temps = {'Date': [1750.0, 1750.25, 1750.5], 'Anom': [-0.466, -0.836, -0.678]}
df = pd.DataFrame(global_temps)

date = df.Date
temp = df.Anom + 8.6

# Calculate the moving average with a window size of 30
moving_avg = temp.rolling(window=30).mean()

# Calculate the standard deviation of the moving average
moving_std = temp.rolling(window=30).std()

# Calculate the upper and lower bounds of the confidence interval
upper_bound = moving_avg + 1.96 * moving_std
lower_bound = moving_avg - 1.96 * moving_std

plt.plot(date, temp, linewidth=0.4, markersize=5, color='green')
plt.xlabel('Year')
plt.ylabel('Temperature')
plt.title('Global Temperatures')

plt.plot(date, moving_avg, linewidth=1, color='red')
plt.fill_between(date, upper_bound, lower_bound, color='lightblue', alpha=0.5) # Plot the confidence interval
plt.show()
```

"Socratic" experiment with chatGPT

The world is the third planet from the sun in our solar system. It is the only known planet with life, and it has a diverse range of ecosystems and climates!"

The world has a circumference of approximately 40,075 kilometers (24,901 miles) at the equator and a diameter of about 12,742 kilometers (7,918 miles)."

The world's population is currently estimated to be over 7.9 billion people, spread across nearly 200 countries and territories.

"The Earth flaunts a magnificent equatorial circumference of around 40,075 kilometers, encompassing a celestial wonderland that spans over 24,901 uplifting miles. In awe-inspiring fashion, our planet unveils its grandeur through a remarkable diameter of roughly 12,742 kilometers, which translates to a mesmerizing expanse of 7,918 enchanting miles.

"With over 7.9 billion souls inhabiting close to 200 diverse nations and territories, our world thrives in a magnificent tapestry of humanity"

Time series data

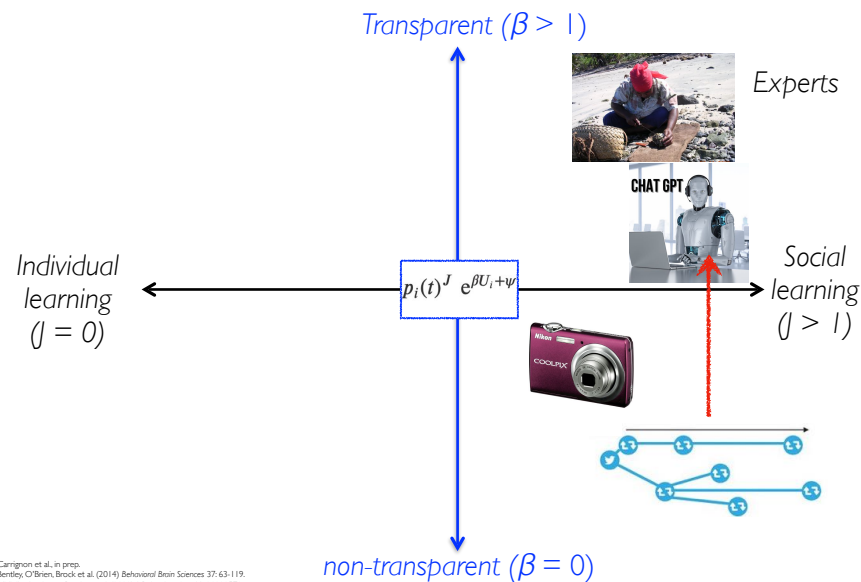
Time step

Time step

Time step

Carrington et al. in prep.

Estimate case studies from time series data (using Random Forest Approximate Bayesian Computation)



Conclusions

- The study of how humans learn underlies A.I. and education
- Humans learn socially, from others
- Ideally, Chat GPT can facilitate a Socratic search of the library of knowledge

