



## **Correlation between academic performance and CO<sub>2</sub> footprint of business air travel at EPFL: Is flying necessary for academic excellence?**

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# Dissecting business air travel habits of EPFL researchers: the second in a three-part investigation

1



Analyze air travel habits of EPFL researchers and identify CO<sub>2</sub> footprint reduction potential and measures

2



Investigate correlation between academic performance and air travel habits of the researchers

3



Qualitative analysis: survey about researchers' travel habits and motivation



# We studied the correlation between the air travel CO<sub>2</sub> emissions of 411 senior EPFL researchers and their academic performance

## Air travel database

- 411 senior researchers
- All EPFL air travel with Carlson Wagonlit Travel (CWT)
- Contains 80 % of total air travels (20 % is booked by credit card)

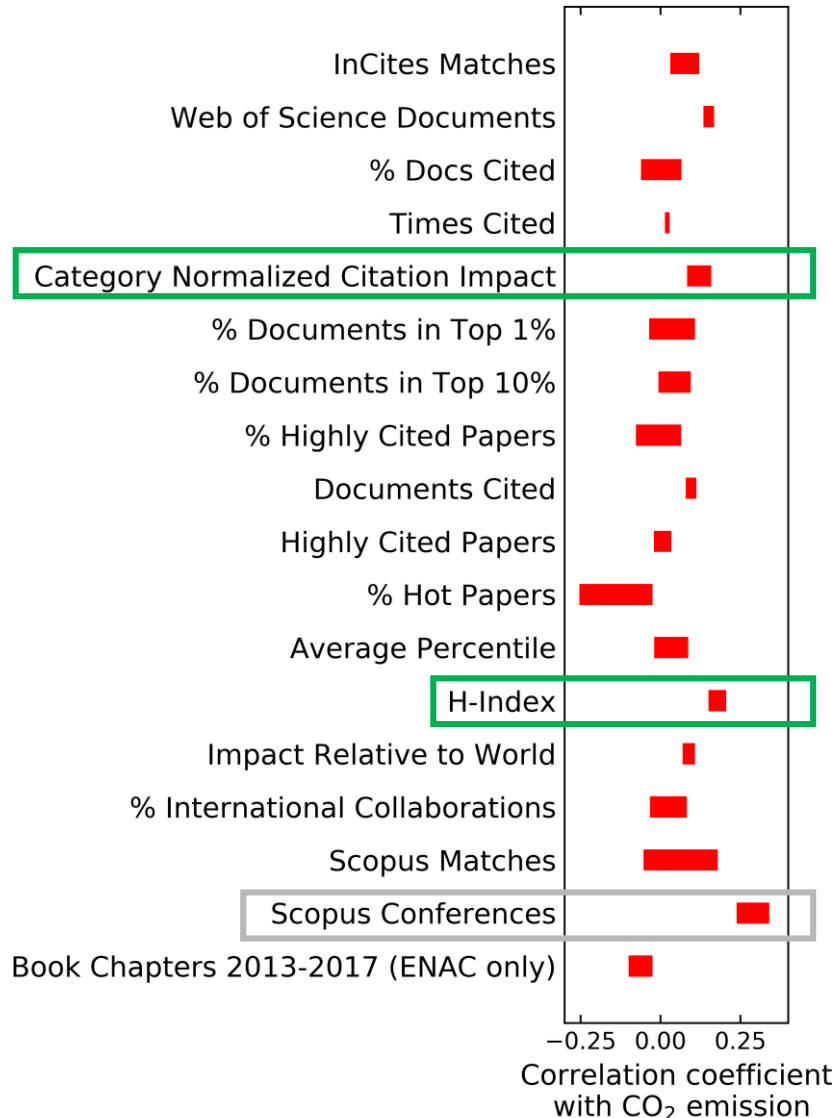


## Academic performance database

- 18 performance indicators
- Based on InCites/Web of Science entries
- Completed with bibliometric data from Scopus and Google Scholar

The correlation was examined for the period between 2014 and 2017

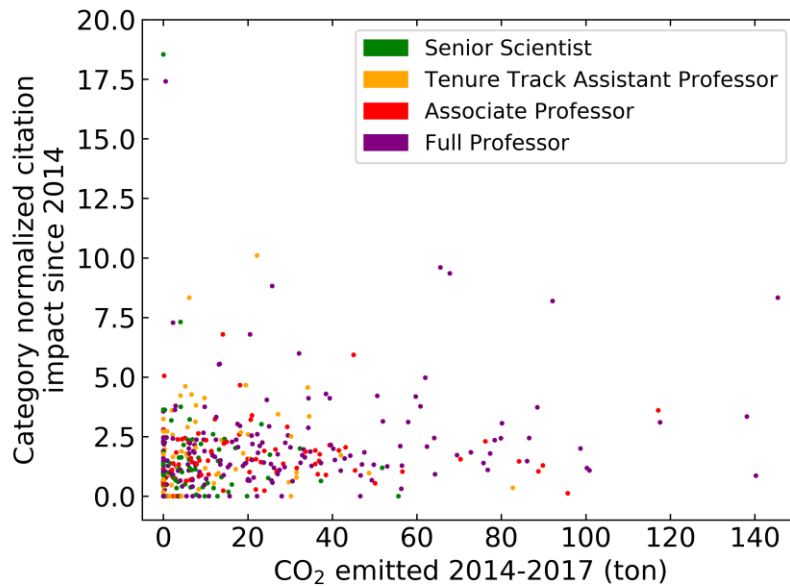
# No academic performance indicator shows any significant correlation with air travel CO<sub>2</sub> emissions



- Correlation is considered **significant** if **|correlation coefficient| > 0.4**
- The **correlation coefficient** of all considered academic performance **indicators** with the researchers' air travel CO<sub>2</sub> emissions is **< 0.3**
- The **highest** correlation of  $0.29 \pm 0.05$  is observed for the number of **conference entries** in the Scopus database
- Widely accepted most accurate indicators are **H-index** and **Category Normalized Citation Impact (CNCI)**

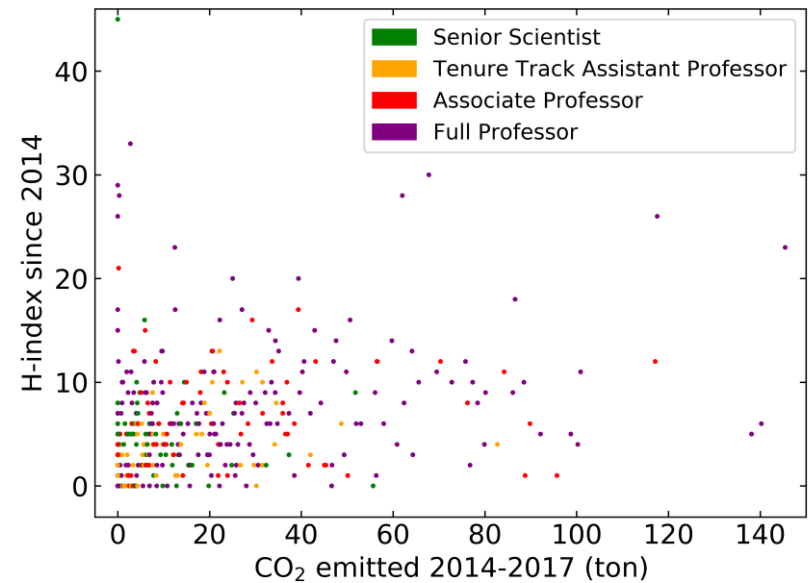
# Overall correlation between the CO<sub>2</sub> emissions and the most important performance indicators is insignificant

CNCI vs CO<sub>2</sub> emission (raw data)



**Correlation coefficient of  $0.12 \pm 0.04$**

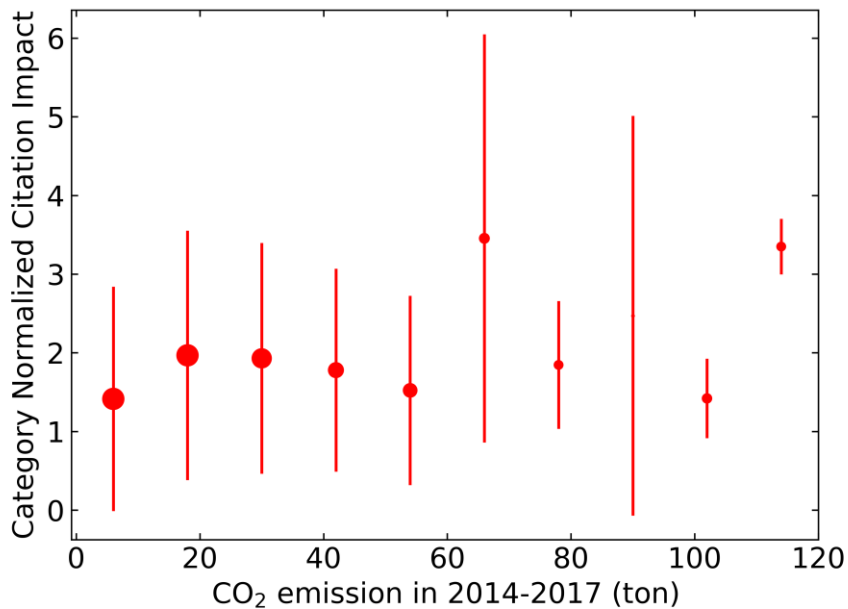
H-index vs CO<sub>2</sub> emission (raw data)



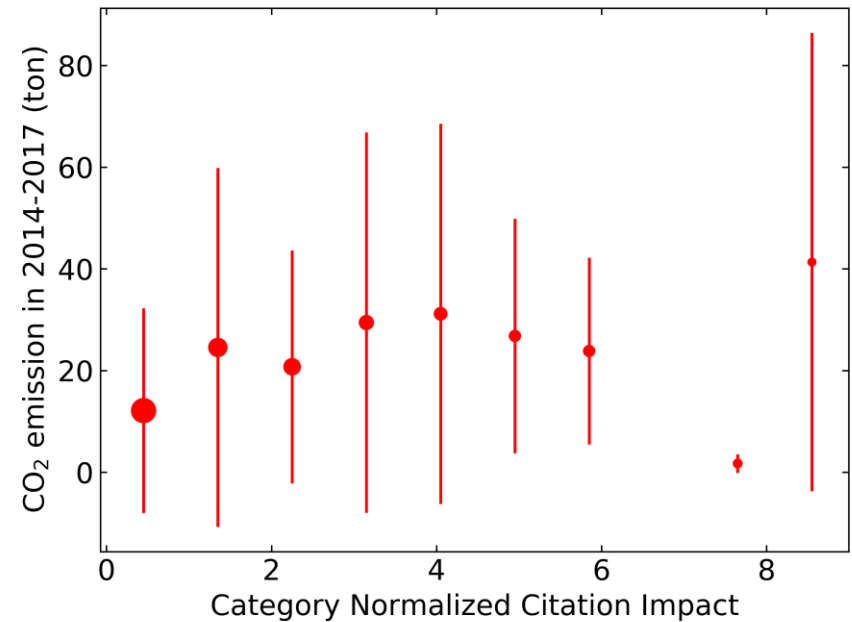
**Correlation coefficient of  $0.18 \pm 0.03$**

# The correlation between category normalized citation impact (CNCI) and CO<sub>2</sub> emission is almost negligible

Binned per CO<sub>2</sub> emission, averaged over CNCI



Binned per CNCI, averaged over CO<sub>2</sub> emission

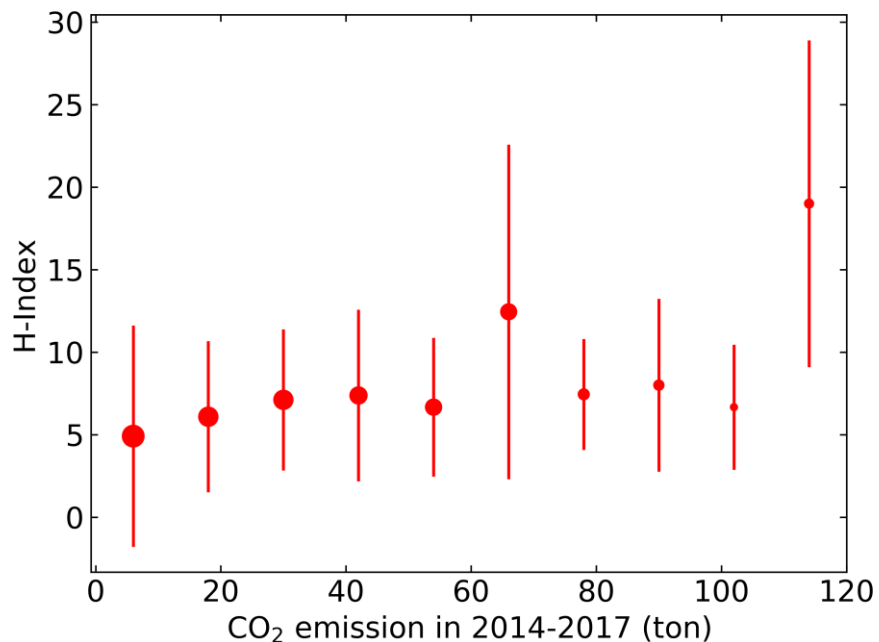


**Correlation coefficient of  $0.12 \pm 0.04$**

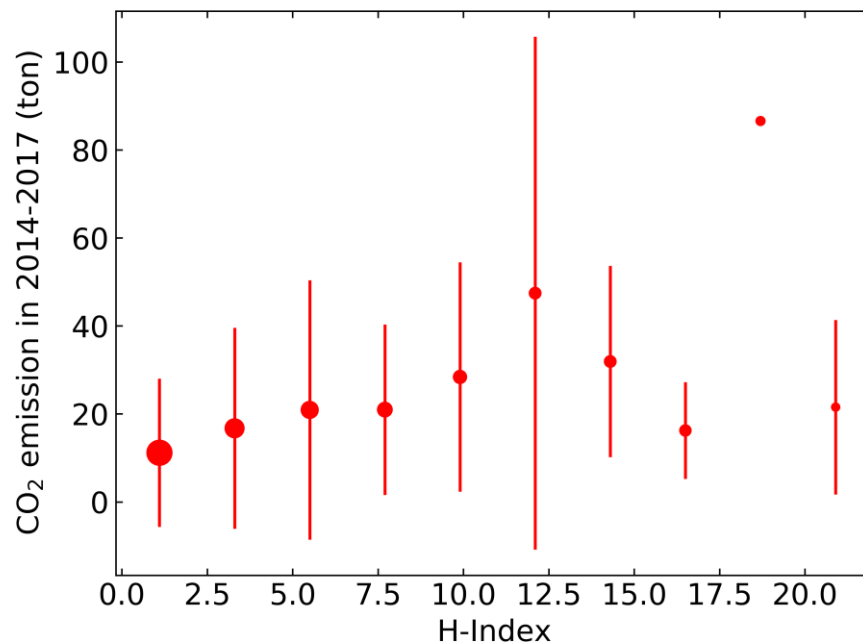
\*Dot size proportional to number of datapoints in the bin

# We observe a very weak correlation between H-index and CO<sub>2</sub> emission

Binned per CO<sub>2</sub> emission, averaged over H-index



Binned per H-index, averaged over CO<sub>2</sub> emission

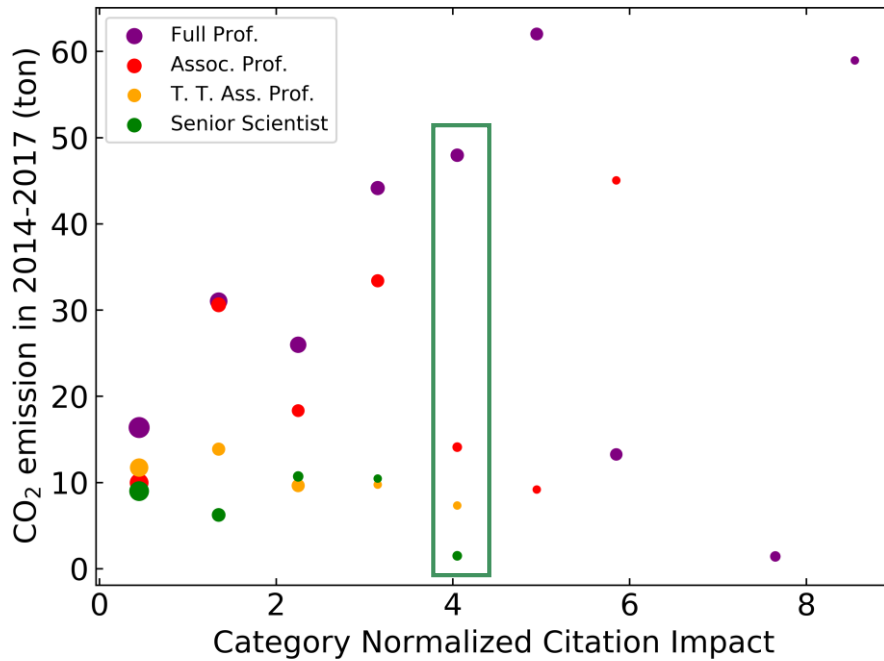


**Correlation coefficient of  $0.18 \pm 0.03$**

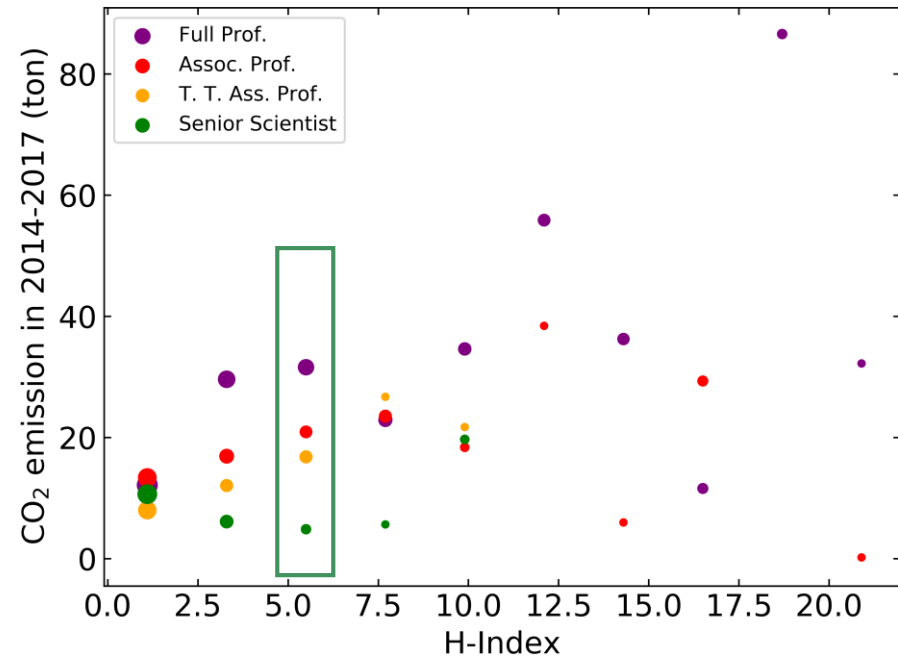
\*Dot size proportional to number of datapoints in the bin

# CO<sub>2</sub> emission increases with seniority for equal academic performance

Binned per CNCI, averaged over CO<sub>2</sub> emission



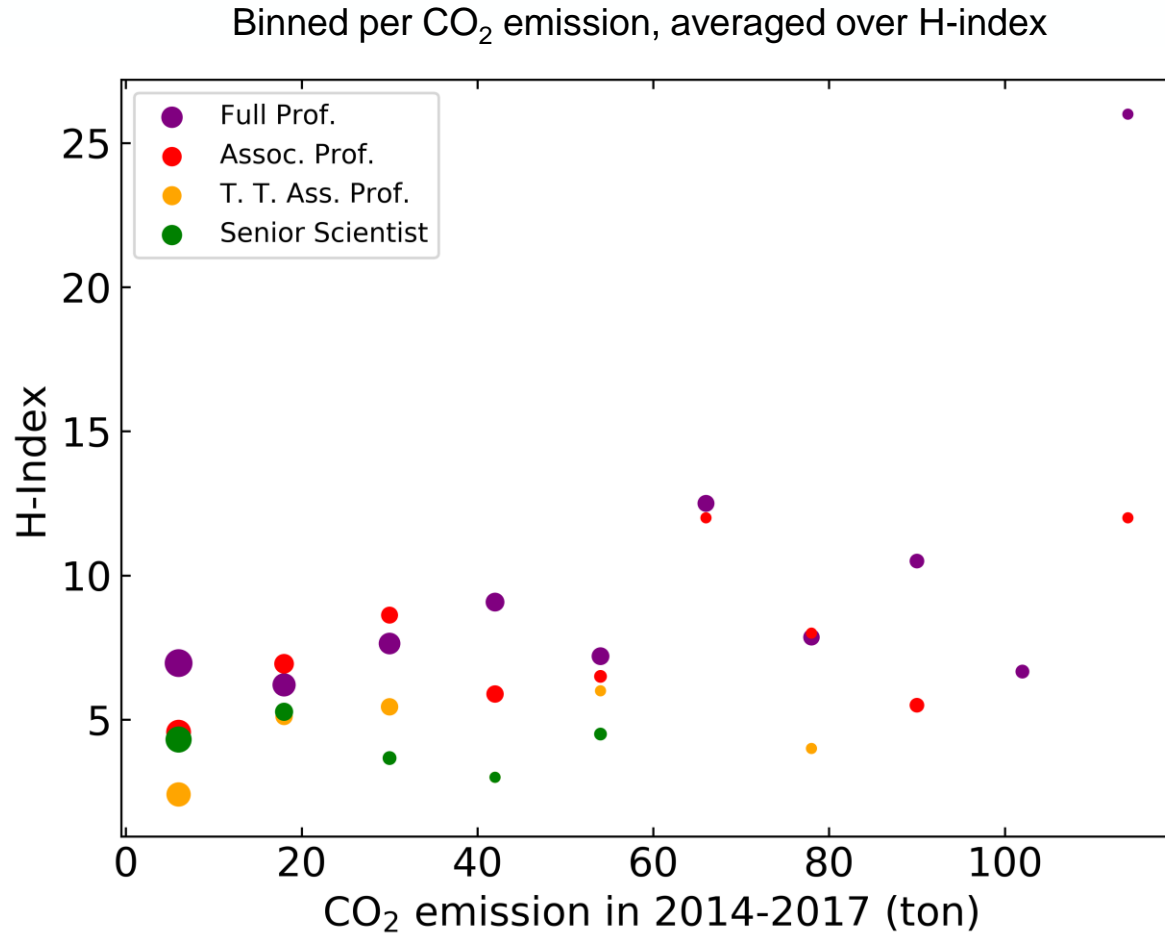
Binned per H-index, averaged over CO<sub>2</sub> emission



\*Dot size proportional to number of datapoints in the bin

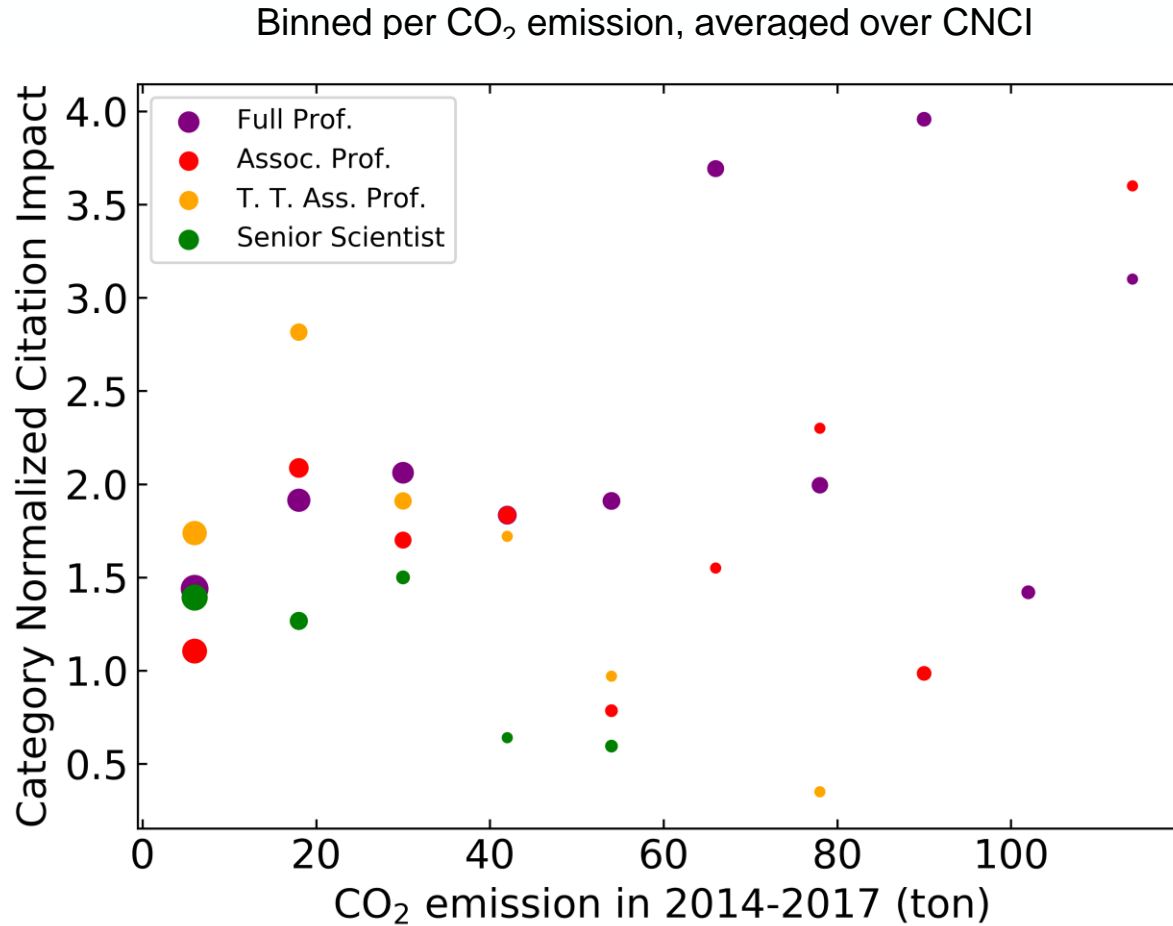


# H-index increases slightly with seniority, very weak dependence on CO<sub>2</sub> emission



\*Dot size proportional to number of datapoints in the bin

# CNCI marginally depends on seniority and CO<sub>2</sub> emission



\*Dot size proportional to number of datapoints in the bin

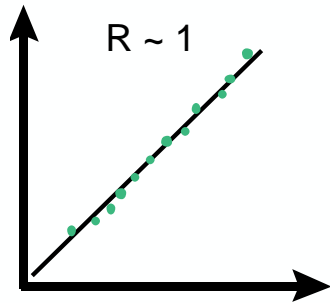


## Summary

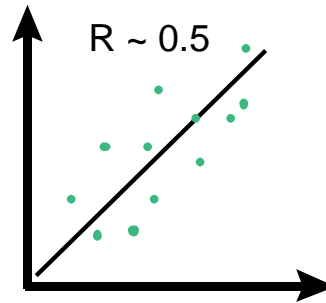
- We demonstrated that there is **no significant correlation** between **scientific impact**, measured by 18 different parameters, and **CO<sub>2</sub> footprint** from air travel for senior EPFL researchers.
- We observe increased CO<sub>2</sub> emissions from more senior Professors for equal academic performance. **CO<sub>2</sub> footprint** seems to **depend more on seniority than academic performance**.
- From these results, it can be concluded that a **large air travel footprint** provides **a small to negligible added value** for **academic performance** among senior EPFL researchers.

# Appendix: The correlation coefficient R represents how linearly dependent two parameters are

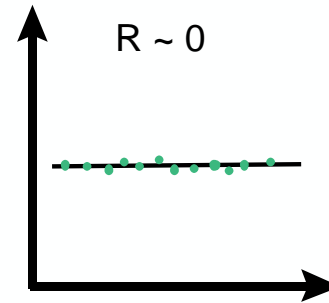
Strong correlation



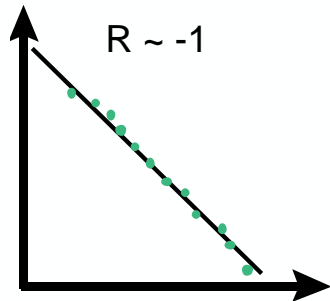
Medium correlation



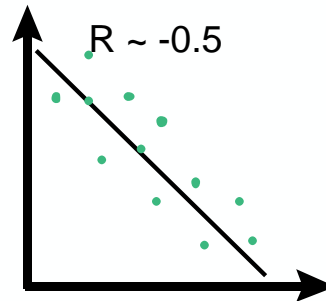
No correlation



Strong neg. correlation



Medium neg. correlation



No correlation

