

Learning Research Methods with AI as a Private Tutor

ICA-Edu 2024 Webinar No 4: AI competences in higher education (26/11/2024)

Michaël de Clercq

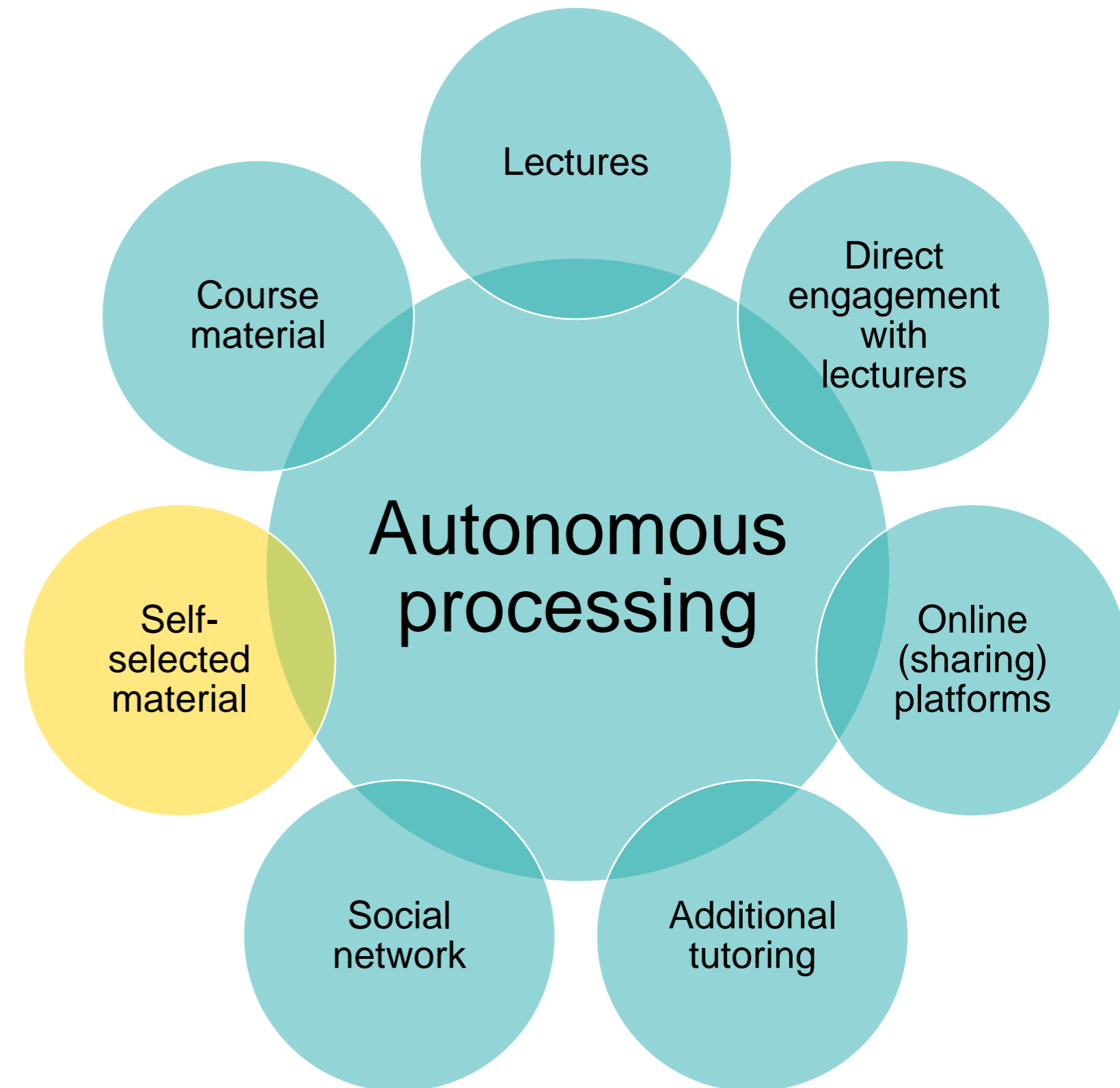
WHO AM I

- Michaël de Clercq
- Ghent University, Belgium
- Faculty of Bio-Science Engineering
- Department of Agricultural Economics
- PhD student and teaching assistant

- Research on digital economics
- More specifically, broadband infrastructure and its regional economic implications
- (Spatial) panel data econometrics, growth theory, network analysis, and agent-based modelling

AI AS A PRIVATE TUTOR

- Traditional learning channels
- **Self-selection**: driven by
 - Proactivity?
 - Limited access to other channels?
 - ””



SOME INITIAL REFLECTIONS

- GenAI hallucinations (cfr. “traditional” misinformation)
 - Diminishing traceability?
 - AI-generated content is filling the Internet
 - ... and overtaking “traditional” search engines, databases, ... ?
 - What is the future of searching for information?
- Global contest for AI supremacy
 - Strategic imperative: information capital and accumulation?
 - Can information capital owners steer hallucinations?
 - Fragmented and dynamic market (with oligopolistic tendencies) or monopolizing training data (cfr. OpenAI’s API)?

THIS WEBINAR

- Not an overview of AI tools and platforms
 - Focus on ChatGPT as an all-round tool (paid subscription)
 - Mindset rather than tools application
- Independency from narrative output
 - Circumvent issues of hallucinations and accumulation of information
 - Exploit multimodal genAI's capabilities to follow tailored instructions
 - Human—AI collaboration
- Inspiration for teachers, researchers, and (PhD) students

THIS WEBINAR

Journal Impact Factor (JIF)[™] 2022: 0.2 | 5 Year: 0.2 | Source: Journal Citation Report[™] 2023 (Clarivate Analytics)



RUPKATHA JOURNAL
ON INTERDISCIPLINARY STUDIES IN HUMANITIES



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<https://doi.org/10.21659/rupkatha.v15n4.17> | Volume 15, Number 4, 2023 | Dynamic Impact Dimensions

Potentially Reliable

Research article

Hallucinations in ChatGPT: An Unreliable Tool for Learning

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GENERATING DATASETS

Prompt (1)—Context:

“Let us assume a fictional global population of 2,000 humans inhabiting a planet called ‘Earth’. You and I are extraterrestrial creatures with complete information about every single human being. To present some descriptives regarding these humans at an upcoming intergalactic conference, we will compile an Excel dataset containing information that I will disclose later.”

- **Sampling**
- Engaging context

GENERATING DATASETS

Prompt (2)—Instructions:

“The end result needs to be an Excel file, but use Python to establish the dataframe as it simplifies the data generating process. Make sure that I can easily adjust the parameters in the code. If you establish certain distributions to draw data from, please always include some noise—even though we have complete information about our humans, their actual behaviour is still a mystery at times and our extraterrestrial science has not yet identified the full set of explanatory variables and their exact dynamics.

- Tailored instructions
- Flexible instructions
- Engaging context

GENERATING DATASETS

Prompt (3)—Implicit coding:

“1. The identification number belonging to a specific human (1-2,000)
2. Their gender (“Male” or “Female”). Assume that the proportion of “Male” equals 48% and hence the proportion of “Female” = 52%. Proceed however you deem fit to establish these exact proportions. You may, for example, want to generate a gender vector with $0.48 \cdot 2000$ times “Male” as an entry, and $0.52 \cdot 2,000$ times “Female” from which to draw from without replacement. Up to you, but keep the code as simple and efficient as possible.”

- Tailored instructions
- Flexible instructions
- Suggestive instructions

GENERATING DATASETS

Prompt (3)—Alternative:

“1. The identification number belonging to a specific human (1-2,000)
2. Their gender (“Male” or “Female”). Assume that the proportion of “Male” equals 48% and hence the proportion of “Female” = 52%. Proceed however you deem fit to establish these exact proportions. You may, for example, want to generate a gender vector with $0.48 \cdot 2000$ times “Male” as an entry, and $0.52 \cdot 2,000$ times “Female” from which to draw from **with replacement**. Up to you, but keep the code as simple and efficient as possible.”

- **Suggestive instructions:** test different statistical properties, practise reasoning (and coding) logic, ...

GENERATING DATASETS

Prompt (4)—Implicit coding:

“3. Their country. Let us assume four different countries: “A”, “B”, “C”, and “D”. Some countries have larger populations than others.

4. A regional classification within their country. Let us categorize their region as either “Urban” or “Rural”. Urban regions tend to have higher population numbers than rural regions (but not to extreme degrees).

5. Their age. For some odd reason, there is not a single human alive who is < 18 years of age, and also not a single human > 65 years of age. Future research should investigate this phenomenon, but it is not our priority. Use a specific data generating process and add noise, but do not tell me which one so I can attempt to uncover it myself.

- Flexible instructions
- Practise

GENERATING DATASETS

Prompt (5)—Implicit coding:

“6. Their school. Let us not consider too many different schools across the population, but let’s establish that urban areas tend to have more school than rural areas. Label accordingly so it is easy for us to distinguish. Obviously, a school is situated within the lowest geographical unit, and hence cannot contain citizens from a different region or country.

7. Their classroom. Determine an appropriate number of people per room, but stick to the same geographical constraints: humans belonging to the same classroom should belong to the same school as well, and therefore also belong to the same regional classification and country.”

- Consistency

GENERATING DATASETS

Prompt (6)—Implicit coding:

“8. Their school results between 0 and 100. Implement some realistic variation across countries, regional classification, and schools. Perhaps there should be less variation between classrooms.

Let me know if you have any considerations that I may have missed, or if you need any further clarification. Please elaborate on any decisions that you have made—except for the age DGP.”

- Increased transparency

GENERATING DATASETS

Certainly! I'd be happy to help you generate this dataset.

Considerations and Clarifications

Before proceeding, I'd like to clarify a few points to ensure the dataset meets your expectations:

1. Population Distribution Among Countries:

- Do you have specific proportions in mind for the populations of countries A, B, C, and D?
- For example, we could assign:
 - Country A: 35% (700 people)
 - Country B: 30% (600 people)
 - Country C: 20% (400 people)
 - Country D: 15% (300 people)
- These proportions can be adjusted as you see fit.

2. Urban vs. Rural Distribution:

- The names of the schools will be labeled to reflect their location (e.g., "A_Urban_School_1").

4. Classroom Sizes:

- What is an appropriate number of students per classroom?
- Common classroom sizes range from 20 to 30 students.
- We can randomly assign classroom sizes within this range.

5. School Results Variation:

- Implement realistic variations in school results based on:

GENERATING DATASETS

Python code:

Generating the Dataset Using Python

Below is the Python code that creates the dataset according to your requirements. All parameters are adjustable and defined at the beginning of the code for easy modification.

```
python Code kopiëren  
  
import pandas as pd  
import numpy as np  
  
# **Adjustable Parameters**  
  
# Total population  
TOTAL_POPULATION = 2000  
  
# Gender proportions  
GENDER_PROPORTIONS = f
```

```
# **Step 10: Export to Excel**  
df.to_excel('human_population_data.xlsx', index=False)
```

GENERATING DATASETS

- Due to ChatGPT's Python integration, there is no need to run the code yourself in a Python environment.

Run this code and please let me download the resulting Excel file.

```
import pandas as pd
```

```
# **Step 10: Export to Excel**
```

```
df.to_excel('human_population_data.xlsx', index=False)
```



The Excel file has been generated successfully. You can download it using the link below:

[Download the file \[↗\]](#)

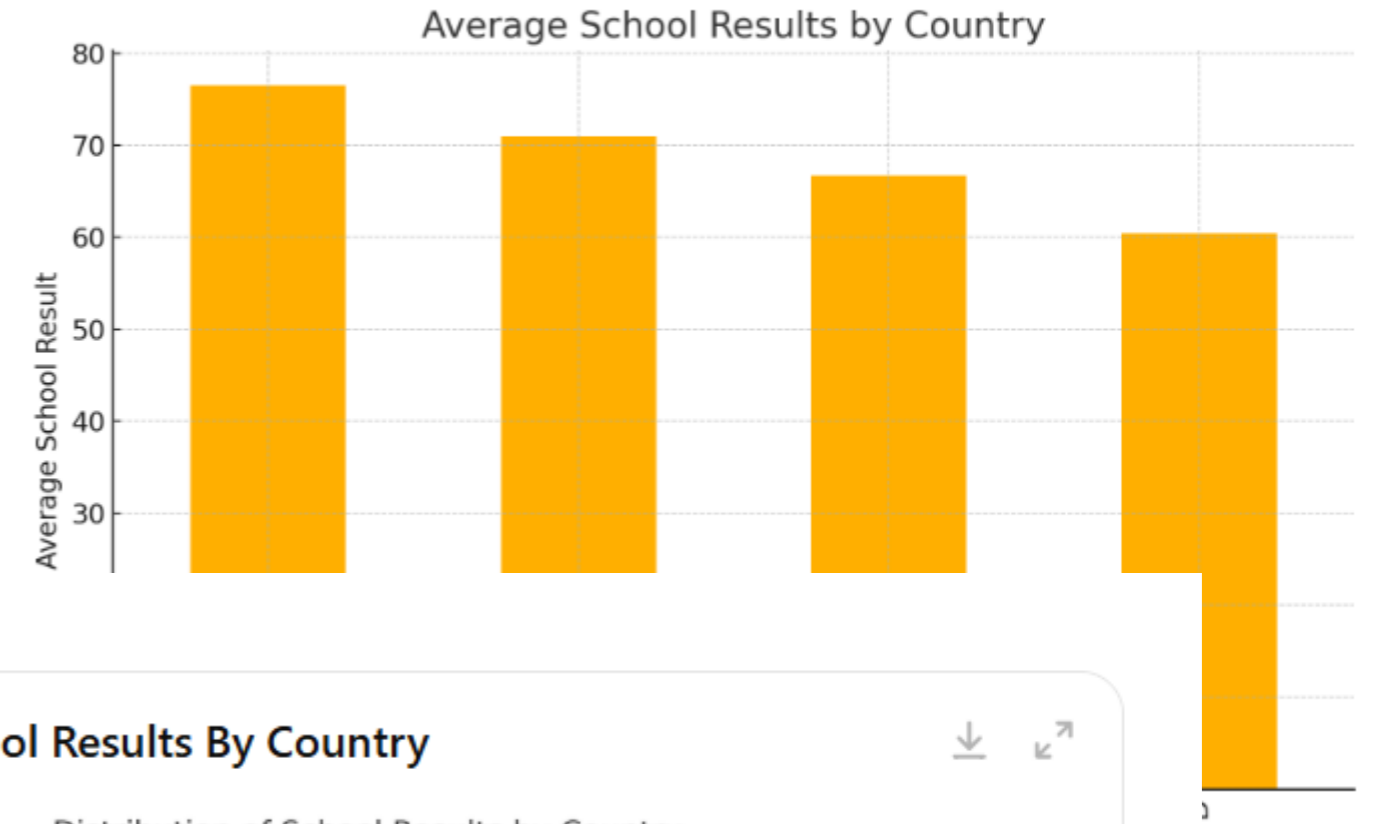
A	B	C	D	E	F	G	H	I
ID	Gender	Age	Country	Region	School	Classroom	School_Result	
1	Male	22	A	Urban	A_Urban_School_1	A_Urban_School_1_Class_3	82,68812356	
2	Female	37	A	Rural	A_Rural_School_1	A_Rural_School_1_Class_4	79,77847565	
3	Female	65	D	Rural	D_Rural_School_1	D_Rural_School_1_Class_1	69,84641862	
4	Female	29	A	Urban	A_Urban_School_5	A_Urban_School_5_Class_2	65,02767606	
5	Male	30	A	Urban	A_Urban_School_5	A_Urban_School_5_Class_4	96,17044925	
6	Male	37	C	Urban	C_Urban_School_3	C_Urban_School_3_Class_1	81,90529644	
7	Male	20	B	Urban	B_Urban_School_4	B_Urban_School_4_Class_2	86,91173045	
8	Female	57	C	Urban	C_Urban_School_1	C_Urban_School_1_Class_1	76,36908079	
9	Female	20	A	Rural	A_Rural_School_1	A_Rural_School_1_Class_5	71.83012928	

GENERATING DATASETS

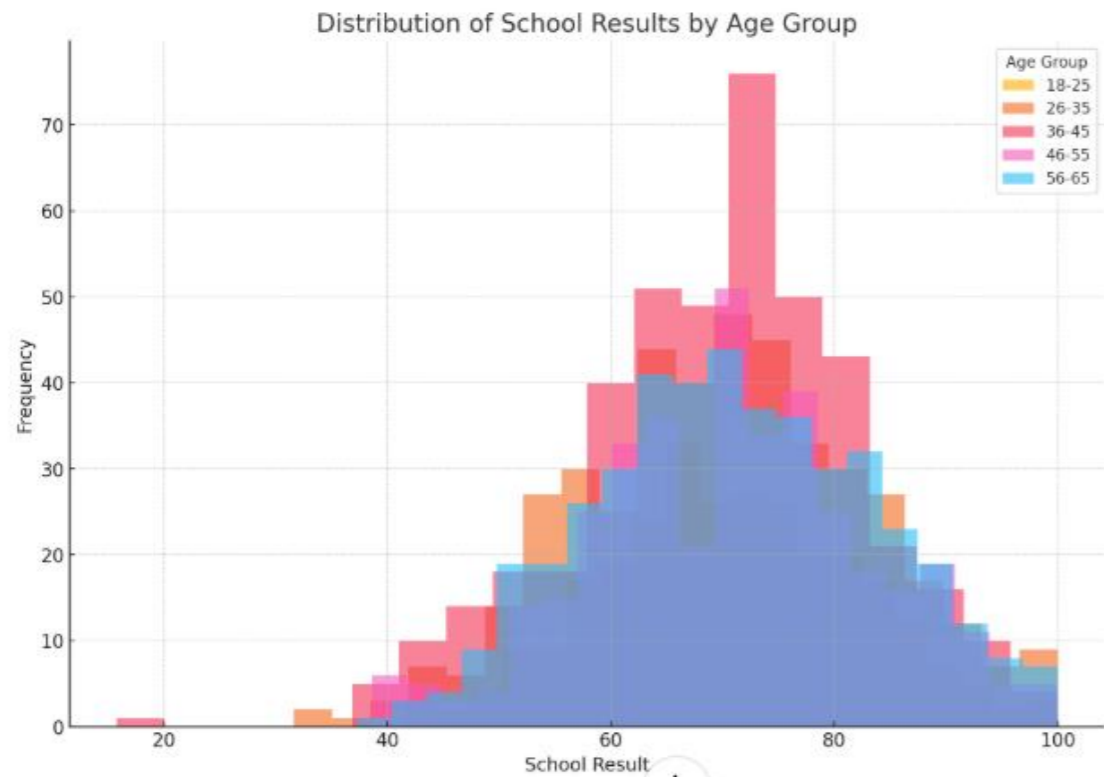


Can you analyze this dataset, and give me some descriptive visualizations that would be appropriate according to you? e.g. cluster some average school results across regions or countries, etc.

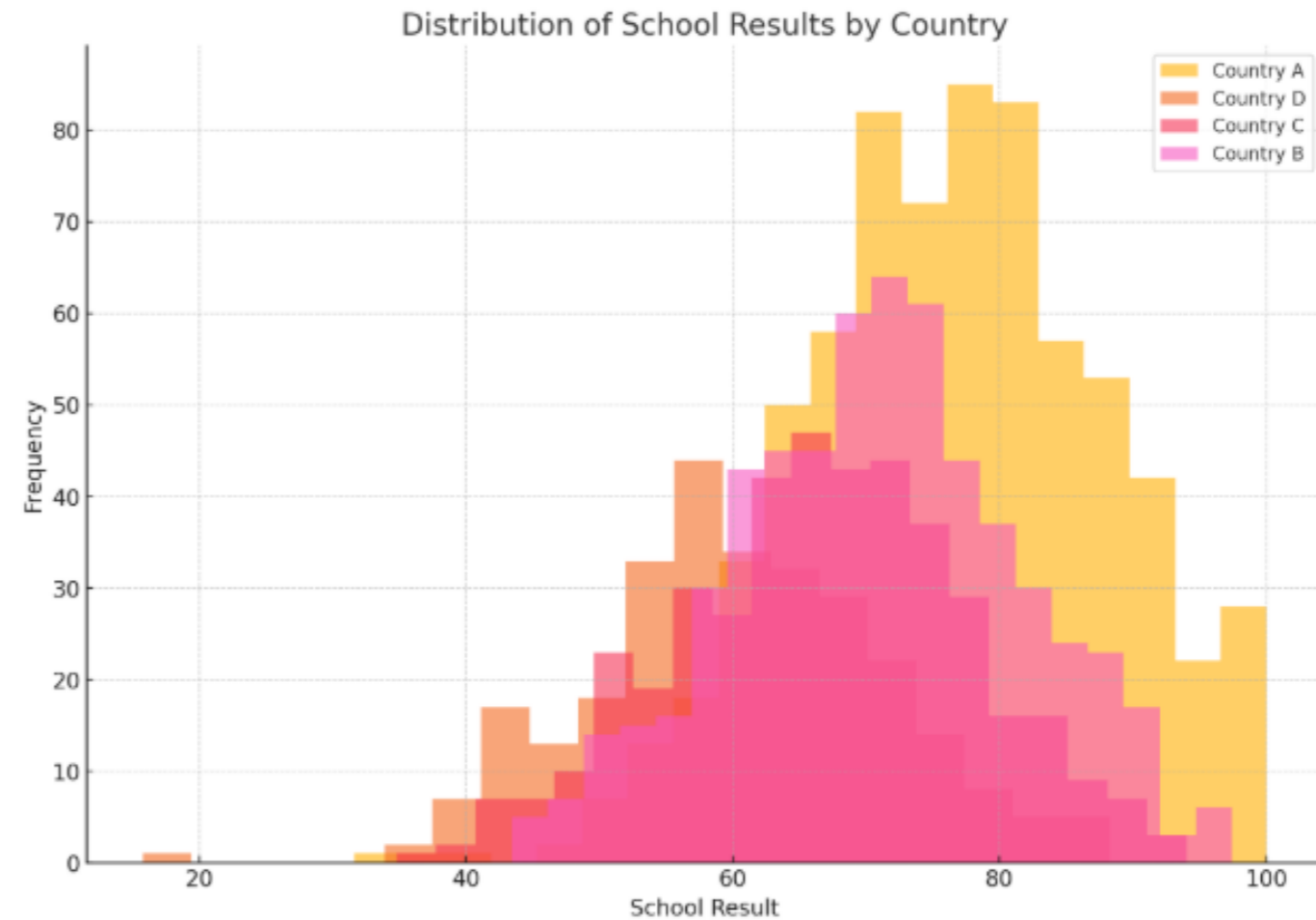
Average School Results By Country



Distribution Of School Results By Age Group



Distribution Of School Results By Country



Ave. Show gender-based scores across countries.

Analyze correlation between age and scores.

GENERATING DATASETS

- Exploiting ChatGPT's Python integration offers transparency and replicability.

Here are the descriptive visualizations based on your dataset:

1. **Average School Results by Country:** A bar chart showing the average school results across different countries.
2. **Average School Results by Region:** A bar chart comparing the average school results in urban and rural regions.
3. **Distribution of School Results by Country:** Overlaid histograms showing the distribution of school results for each country.
4. **Average Age by Country and Region:** A stacked bar chart illustrating the average age distribution across regions within each country.

If you need further analysis or specific adjustments, let me know! [>-]

```
different countries.

Analyse x

python

# Create descriptive vi Altijd details weergeven  Code kopiëren

# Visualization 1: Average school results by country
avg_results_country = df.groupby('Country')['School_Result'].m
avg_results_country.plot(kind='bar', figsize=(10, 6), title='A
plt.xlabel('Country')
plt.ylabel('Average School Result')
plt.show()

# Visualization 2: Average school results by region
avg_results_region = df.groupby('Region')['School_Result'].mea
avg_results_region.plot(kind='bar', figsize=(10, 6), title='Av
plt.xlabel('Region')
plt.ylabel('Average School Result')
plt.show()

# Visualization 3: Distribution of school results by country a
```

GENERATING DATASETS

Some basic applications

- Showcase and experiment with different sampling techniques and their implications
- Run regression analyses to uncover imposed structure on the data
- Descriptives
- but also much more...

WORLD SIMULATIONS

Prompt (1)—Expanding:

“Let us now add more columns, as we are slowly gathering more information about our humans.

1. Each human has one of 16 personality types (INTJ-A, ENTJ-A, ... I assume you know which ones I am referring to. Please clarify first by listing all personality types so I can verify your knowledge). Assign one of those 16 personality types to every human. This should be entirely random.”

WORLD SIMULATIONS

Prompt (2)—Expanding:

“2. Assign a socioeconomic status to every human. Let us just label them qualitatively here. Come up with appropriate labels. Socioeconomic status across countries and across regions is unevenly distributed (e.g., higher concentrations of wealth in urban regions, but also wider tails). In order to establish a decent level of variation, come up with at least 8 different labels.”

WORLD SIMULATIONS

Prompt (3)—Expanding:

“3. Some of our humans have decided to marry each other! However, they only marry someone within their own region and country. Marriages between opposite genders are more common than marriages between the same gender. Not everyone is married: if they are not married, then they are assigned a label ‘0’, and if they are married, then they are assigned the ID number of the fellow human that they are married with. Humans cannot marry themselves, and they can also not marry more than one other human. Obviously, if for example ID number 5 marries ID number 7, then ID number 7 also marries ID number 5.”

WORLD SIMULATIONS

Prompt (4)—Expanding:

“4. There has been a sudden baby boom in our population. Assign a realistic random number of children to every human. If they are not married, then we will assume that they also have no children. Ensure consistency across our data: a married couple will have the same amount of children.”

WORLD SIMULATIONS

Prompt (5)—Expanding:

“5. Assign a personality type to their children. For simplicity, let us assume that all children within the same marriage have the same personality type in order to contain this information within a single column. If a human does not have any children, then their personality type is labelled ‘0’. Let us also assume that personality types are not inherited, and hence the assignment is random.”

WORLD SIMULATIONS

Resultaat

```
'/mnt/data/human_population_data_extended_v2.xlsx'
```

The updated Excel file has been generated. You can download it using the link below:

[Download the Excel file \[>-\]](#)



School_Result	Personality_Type	SES	Married_ID	Number_of_Children	Children_Personality_Type
91,55927802	ENFP	High	687	3	ESFJ
80,52106822	ESTP	High	0	0	0
56,31736826	INTP	Lower-Middle	1705	5	ENFP
80,67466485	ENTP	Middle	429	4	ESFJ
84,08610983	ESFJ	High	0	0	0
81,00061006	ISTP	High	1415	2	ESFP
63,87378315	INFJ	High	0	0	0
76,44095422	ISFP	Upper-Middle	0	0	0
61,13677395	INTJ	High	0	0	0
93,51213525	INFP	High	0	0	0
83,67344468	INTP	High	4215	3	ISTP

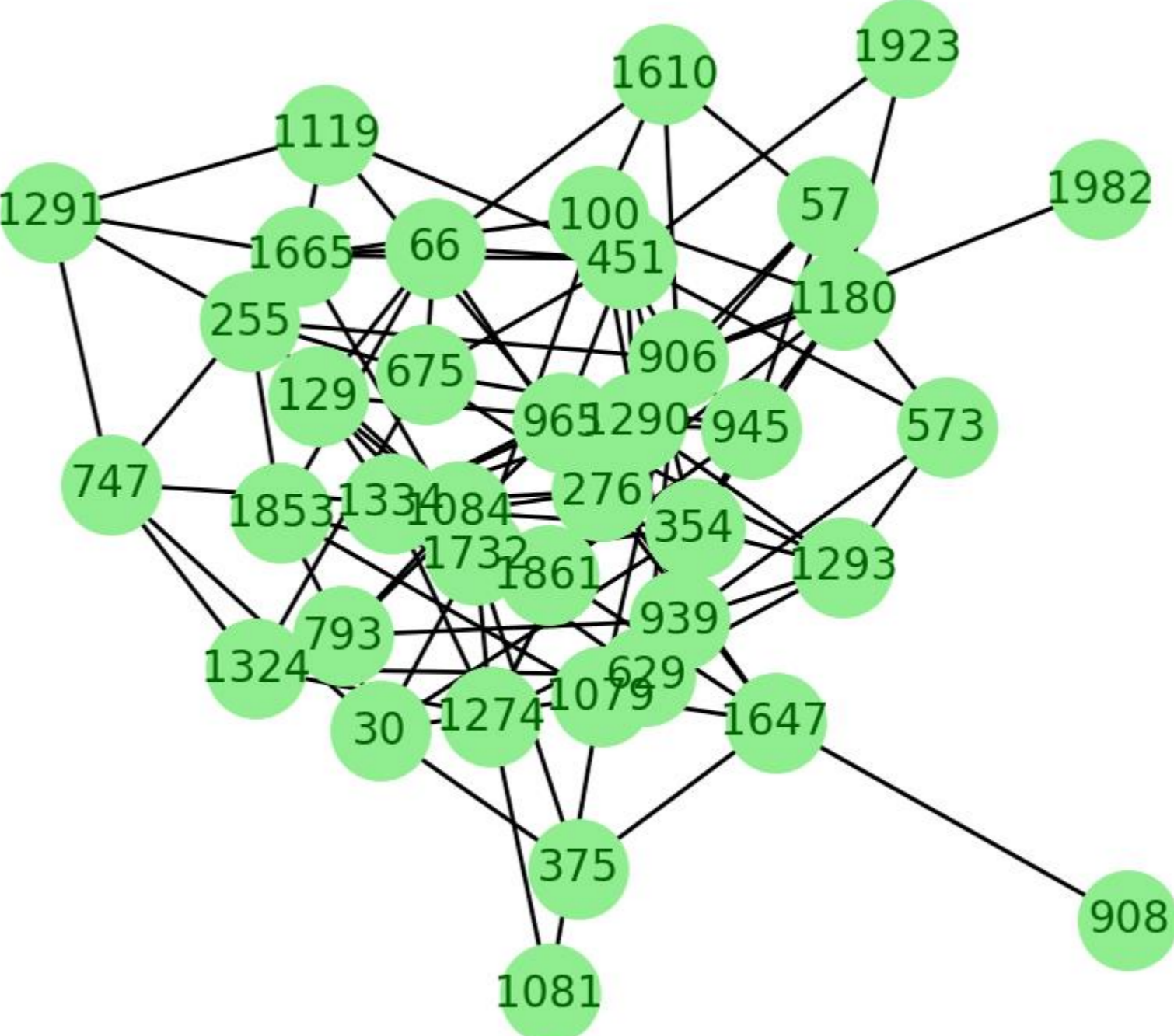
WORLD SIMULATIONS

Prompt (6)—Expanding:

“6. Let us integrate friendships. Add a friendship column that contains a vector of ID numbers representing the close social circle of this individual. Ensure consistency. Each vector contains a random number of IDs between 0 and 5. Then, sample 40 random individuals and visualize their social network using networkx in Python. Include some centrality measures.”

WORLD SIMULATIONS

Friendships:



4	906	0.3333333333333333	3	0.170212240715500	87	0.3333333333333333	5
---	-----	--------------------	---	-------------------	----	--------------------	---

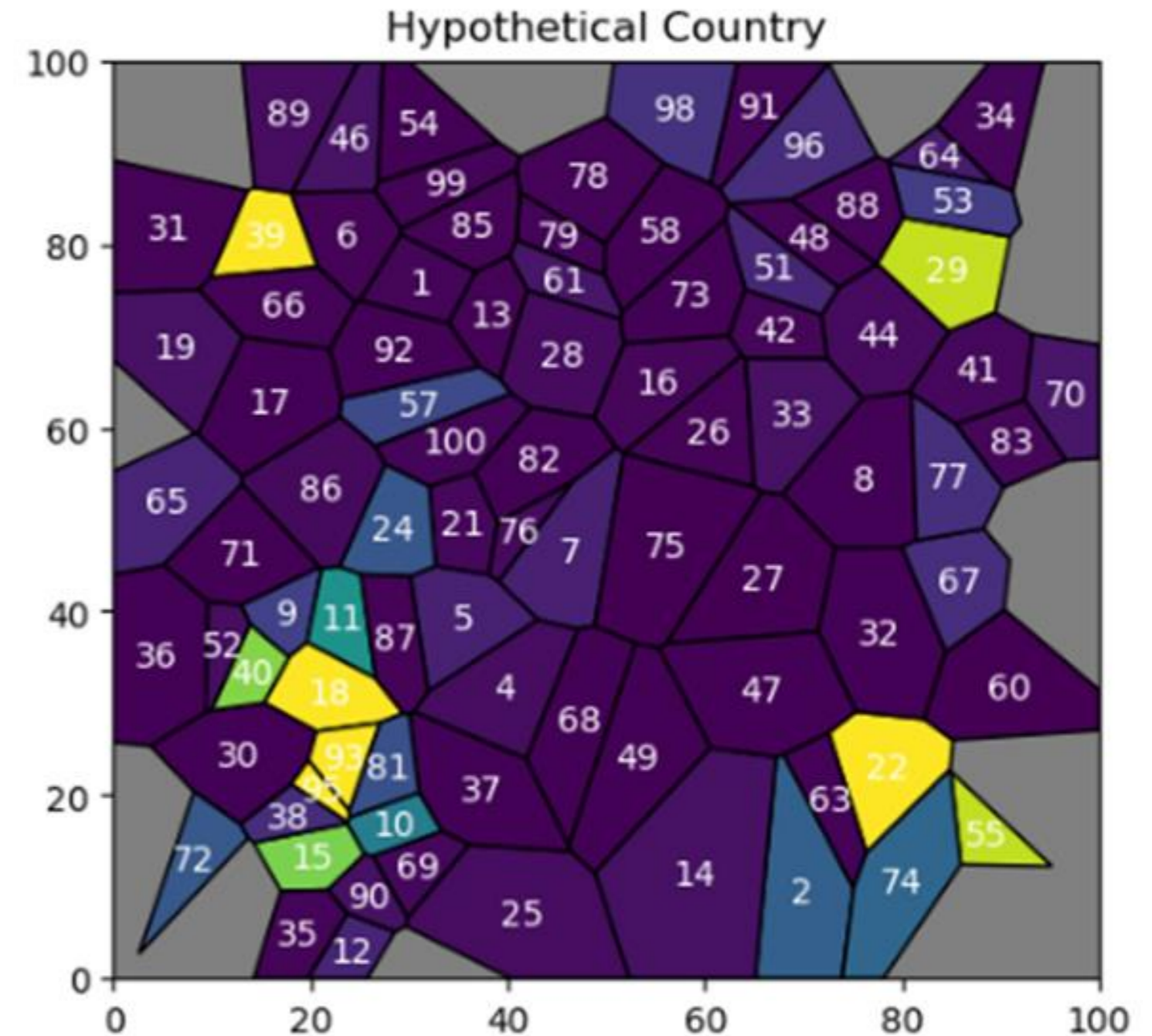
Top 5 Hubs Based On Degree Centrality

ID	Degree Centrality
1 906	0.3333333333333333 3
2 1290	0.230769230769230 75
3 451	0.230769230769230 75
4 1334	0.205128205128205 12
5 100	0.205128205128205

WORLD SIMULATIONS

Prompt (7)—Expanding:

“7. Let us add more specific spatial boundaries. As a test, we will take the individuals belonging to country A, and spread them across a Voronoi diagram consisting of 100 cells. Fix x and y limits from 0 to 100, and colour code the cells by their population densities. Label the diagram as ‘Hypothetical Country’. Infinite Voronoi cells should be greyed out.”



WORLD SIMULATIONS

Prompt (8)—Qualitative expansion:

“8. I want to know more about human no. 642. Please create a vivid persona for this individual (based on our collected data) so I can conduct an interview with them.”

Profile of ID 642

Name: Alexander "Alex" Moreau

- Alex is a thoughtful, introspective, and analytical individual with a deep sense of responsibility and dedication. His INTJ personality type (commonly referred to as "The Architect") suggests he is strategic, future-focused, and enjoys solving complex problems.

Demographics:

- Gender: Male
- Age: 58
- Country: A
- Region: Urban

Family Life:

- Alex is married to Isabelle Moreau (ID 12), a 30-year-old ISFP personality type ("The Adventurer"). She balances his strategic and goal-oriented approach with her grounded, present-focused, and empathetic nature.
- Together, they have three children, all with INFJ ("The Advocate") personality types, suggesting a shared family value of empathy, vision, and idealism.
- Despite their age difference, Alex and Isabelle have found a unique rhythm in their partnership, with Isabelle bringing a spark of creativity and spontaneity to their relationship while Alex anchors their family with structure and long-term planning.

Education and Career:

- Alex attended A_Urban_School_1 and was in Class_4, achieving a school result of 78.22, indicative of consistent effort and competence.
- Though his professional path isn't explicitly mentioned, his background suggests a career requiring analytical and strategic thinking—potentially in management, engineering, or consultancy.

Challenges in Life:



WORLD SIMULATIONS

Interviews:

Hi Alex, thank you for agreeing to this interview. Can you tell me a bit about yourself?



Hello, thank you for having me. It's not every day I get the chance to reflect and share my journey. My name is Alex Moreau, and I'm 58 years old. I live in an urban area of Country A with my wife, Isabelle, and our three wonderful children.

642	Male	A	Urban	A_Urban_School_1	Class_4	58	78,21603963	INTJ	Upper-Middle	12	3	INFJ
12	Female	A	Urban	A_Urban_School_4	Class_0	30	75,83972425	ISFP	High	642	3	INFJ

Isabelle: It might have, but not in obvious ways. For one, I think they pick up on our different approaches to life. Alex is like a lighthouse—steady and guiding—but I think they sometimes see him as distant because of that. Meanwhile, I'm more hands-on, which probably makes me the “go-to” parent for emotional stuff.

There's also the fact that Alex's perspective is shaped by a different generation. Sometimes I have to remind him that what worked for him growing up might not apply to the world our kids are living in now. It's not easy for him to adapt to that, and I can see the kids noticing it.

WORLD SIMULATIONS

Some basic applications (1)

- Bring data to life. Interact with data points. Practise designing (structured) interviews, conducting interviews, coding responses and themes, ..., simulate mixed-methods designs
- Impose network structures and time dimensions
- Simulate hypothetical scenarios:
 - A pandemic occurs at $t=X$: integrate structural breaks, ...
 - ID no. Y conducts a small study regarding Z in their region, but due to limited resources they design a convenience sample. They ...

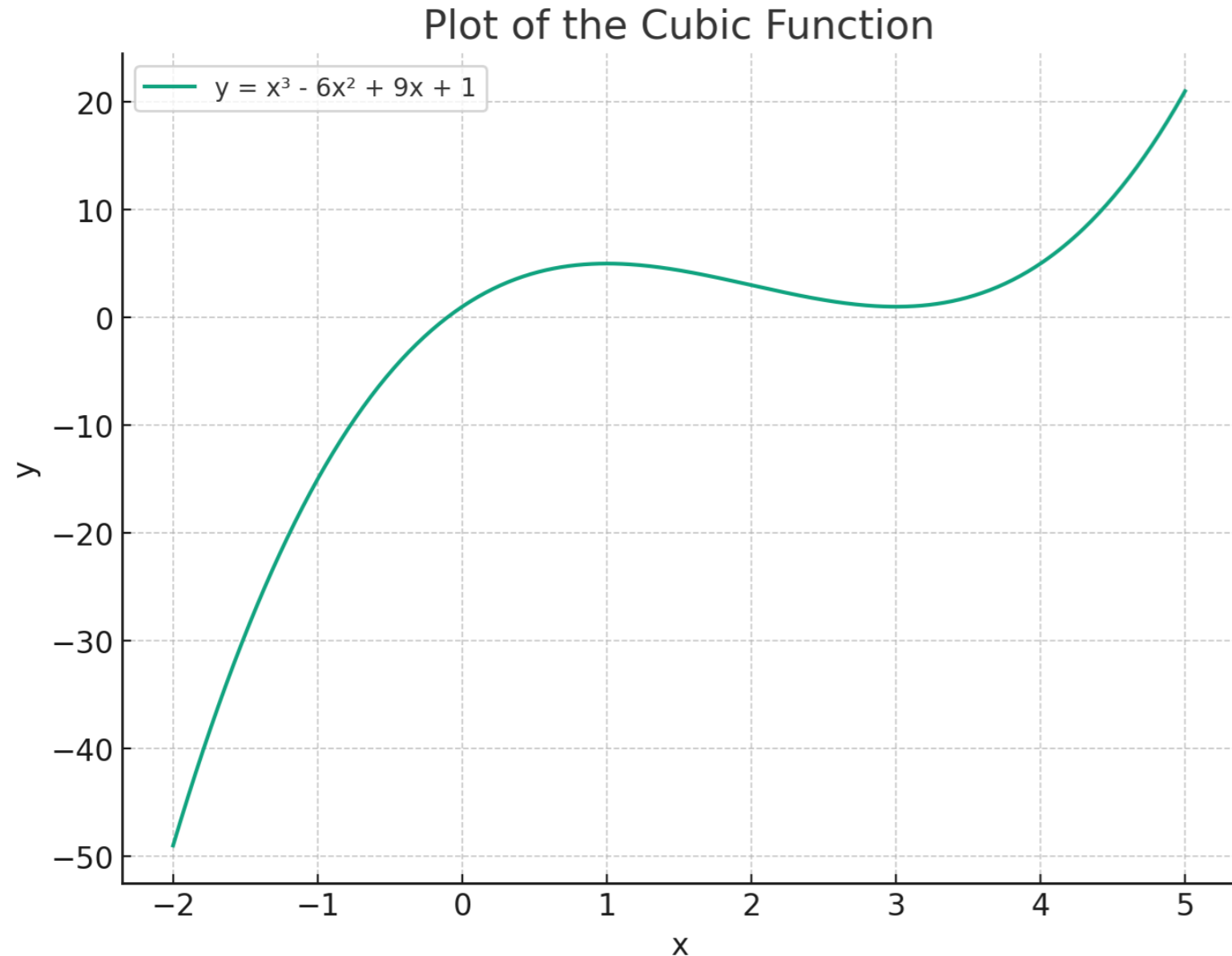
WORLD SIMULATIONS

Some basic applications (2)

- Students can construct research designs within the boundaries of the simulated data
- Convert some stylized sample facts from real data to hypothetical data sets
- Mimic findings from existing literature

SOME EXAMPLES (1)

- “Please plot the following cubic function: $f(x) = x^3 - 6x^2 + 9x + 1$, and randomly extract 50 coordinates.”



Here's a table displaying the 50 randomly extracted coordinates from the cubic function $y = x^3 - 6x^2 + 9x + 1$:

X	Y
1.67	3.96
2.91	1.02
-1.42	-26.78
1.68	3.92
-0.37	-3.18
-0.53	-5.54
3.77	3.25
-0.35	-2.94
2.67	1.30
0.24	2.64

SOME EXAMPLES (1)

- (After loading Excel into a new chat) “Run an OLS regression for me with the following functional form: $Y = \beta_1 X^3 + \beta_2 X^2 + \beta_3 X$.”

```
betas, intercept
```

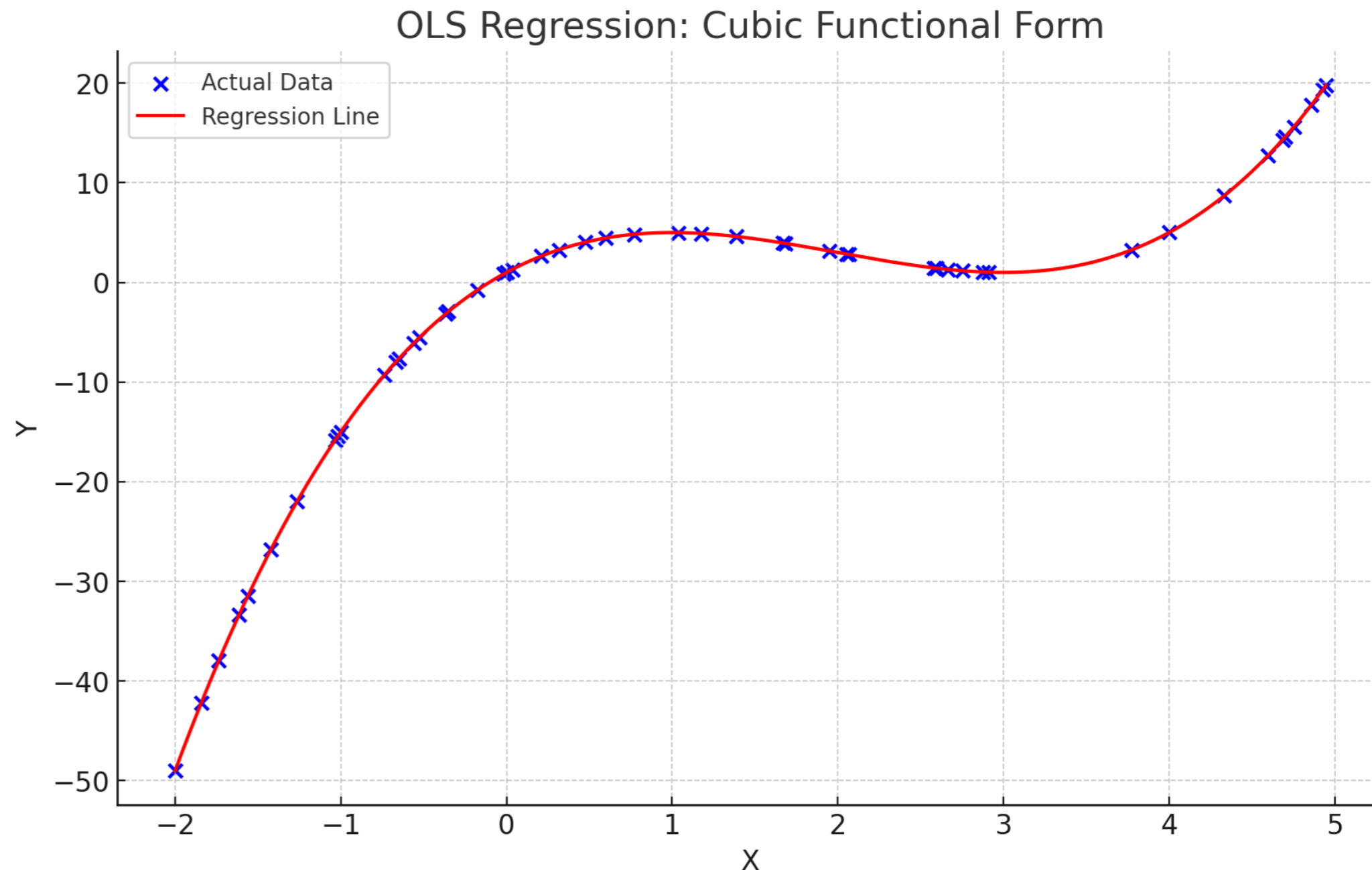
Resultaat

```
(array([ 1., -6.,  9.]), 0.9999999999999964)
```

The OLS regression results for the specified functional form $Y = \beta_1 X^3 + \beta_2 X^2 + \beta_3 X$ are as follows:

- $\beta_1 = 1$
- $\beta_2 = -6$
- $\beta_3 = 9$
- Intercept (not explicitly requested but provided for completeness): approximately 1.00

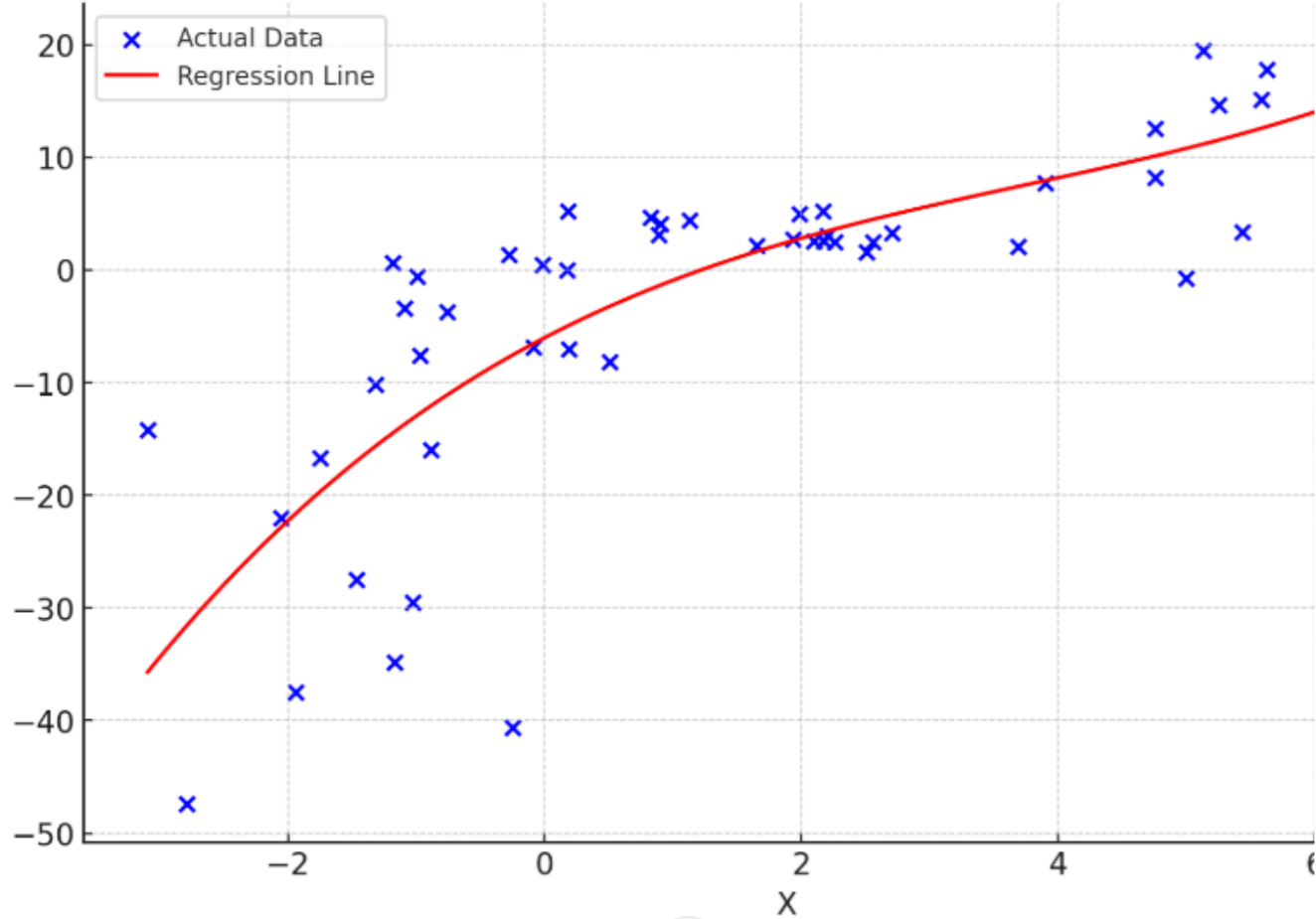
These coefficients indicate the relationship between X and Y as per the cubic function specified. [\[i\]](#)



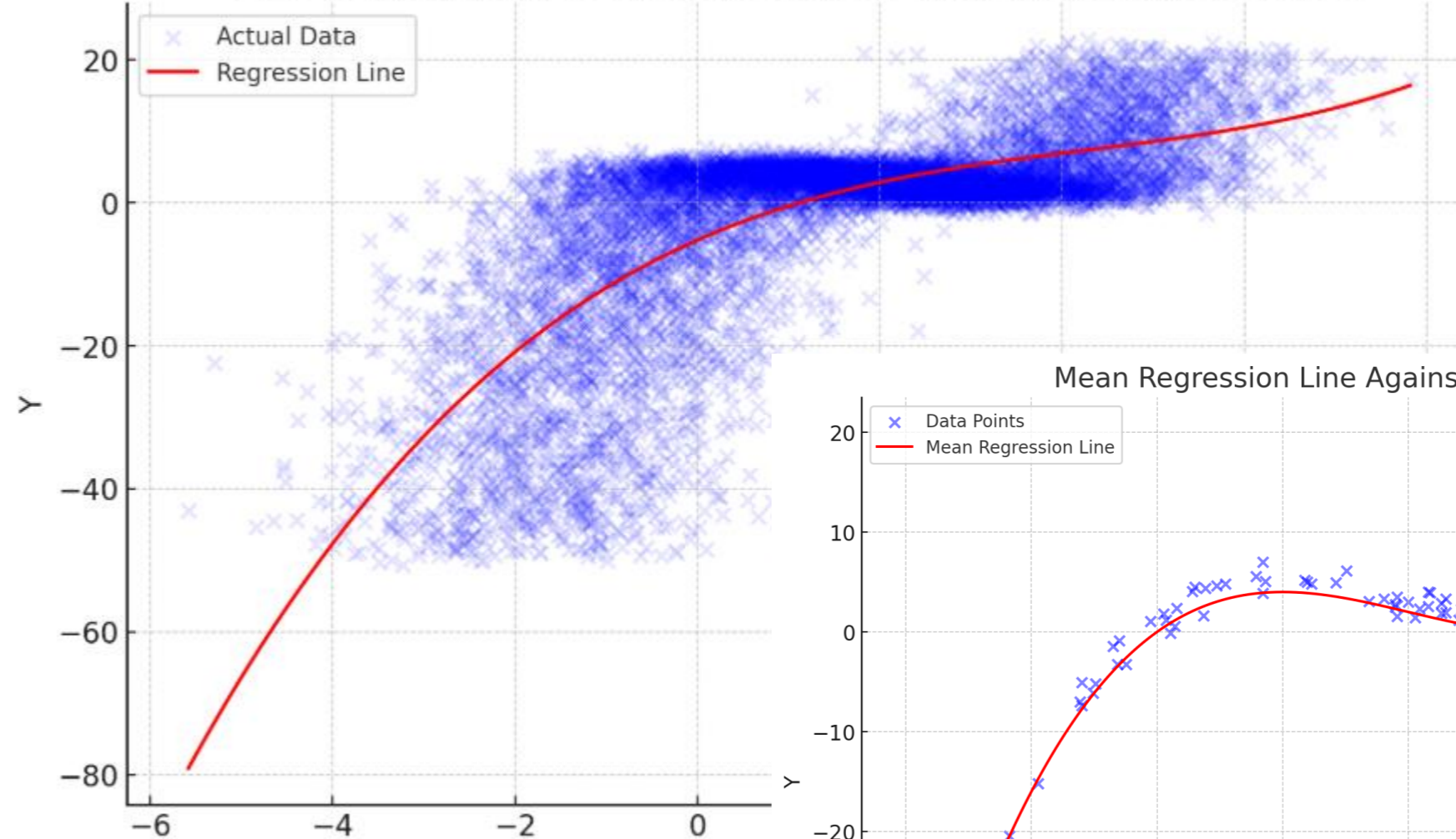
SOME EXAMPLES (1)

- Experiment with statistical errors, their properties, and implications.

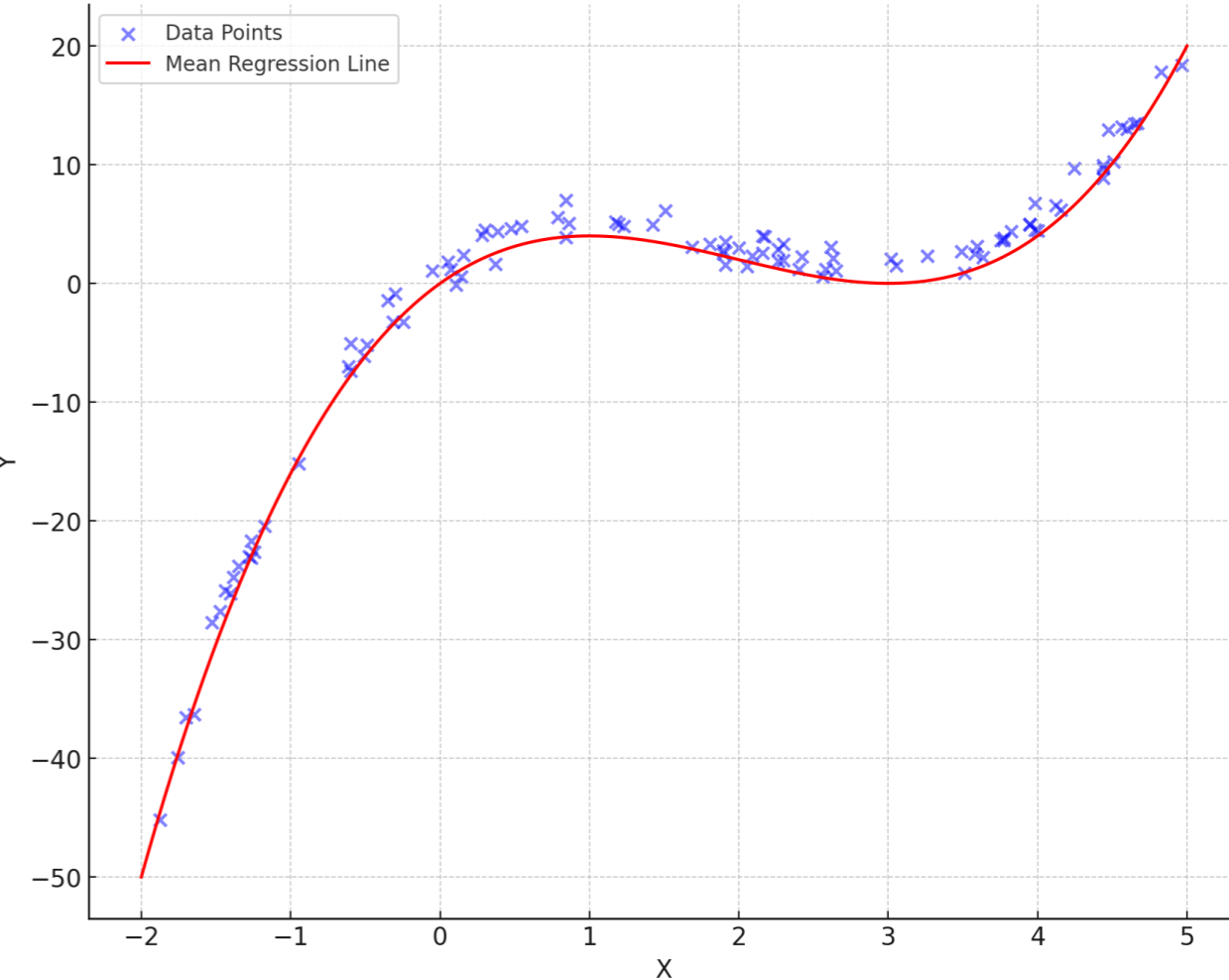
OLS Regression: Cubic Functional Form with New Dataset



OLS Regression: Cubic Functional Form with Large Dataset



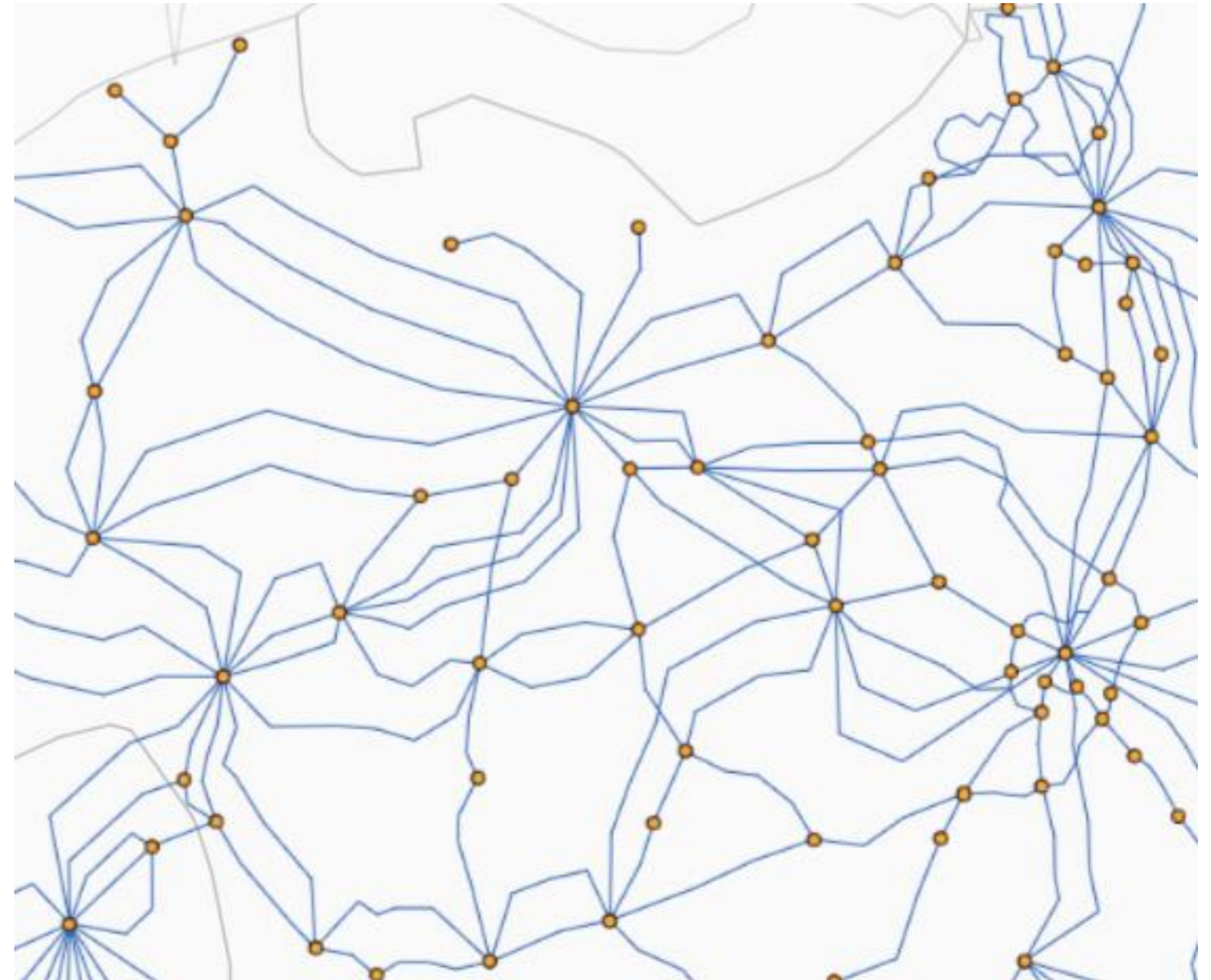
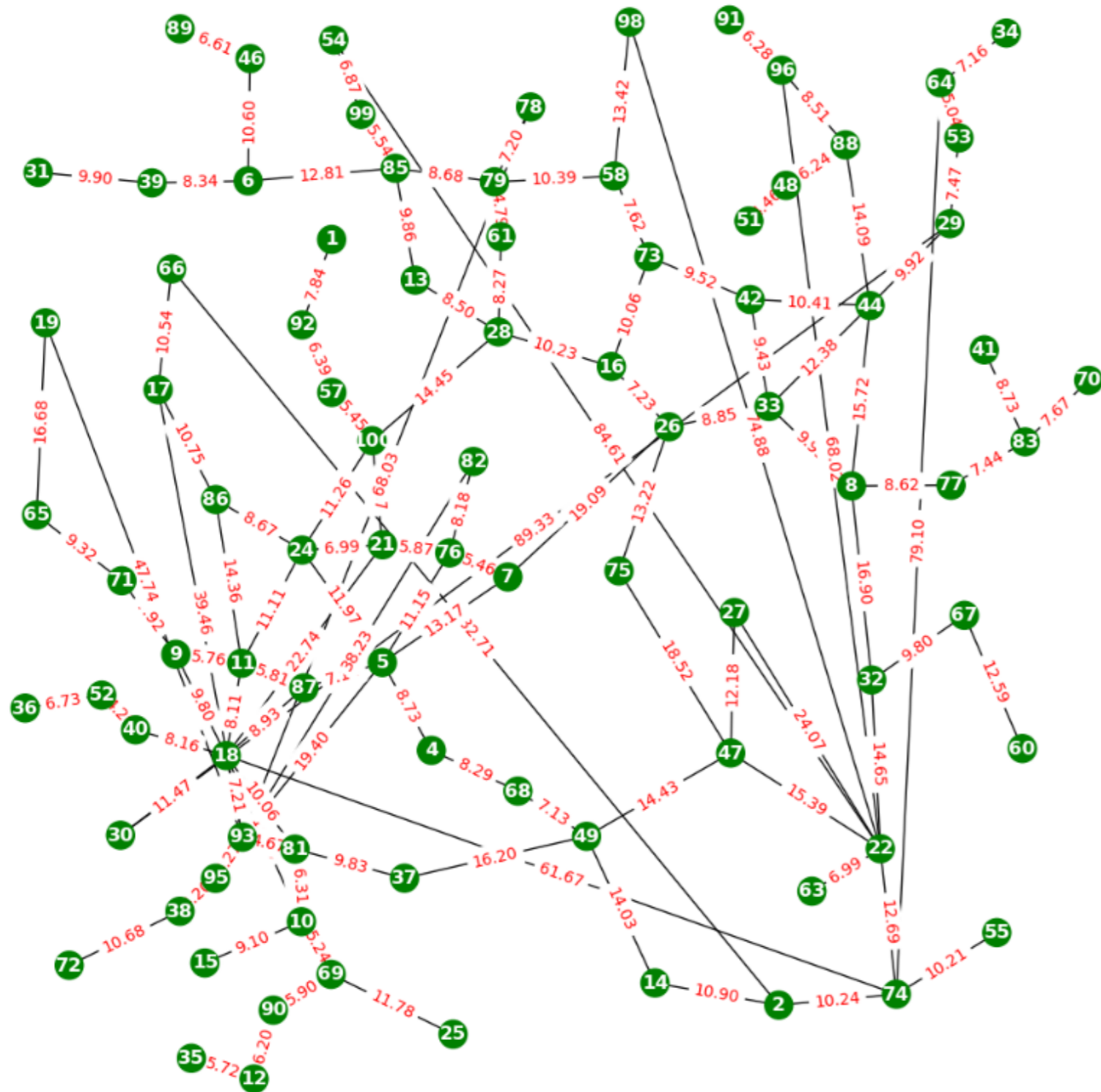
Mean Regression Line Against Data Points



Here's the graph for the new dataset, showing both the actual data points (in blue) and t

SOME EXAMPLES (2)

– Reproduce empirical data.



SOME EXAMPLES (3)

- Extracting data and/or data cleaning.

“I need to extract all dissertation titles from the following document. Since the document is unstructured and spans over 200 pages, we may need a systematic approach. Let us tokenize every paragraph, and only consider paragraphs with at least 8 tokens. These will probably be titles. Add them into a single Excel column. Then, we also need to add publication years. Scan the tokens surrounding the extracted title. The first token in the immediate neighbourhood that represents a year, should be linked in a second column to that specific title.”

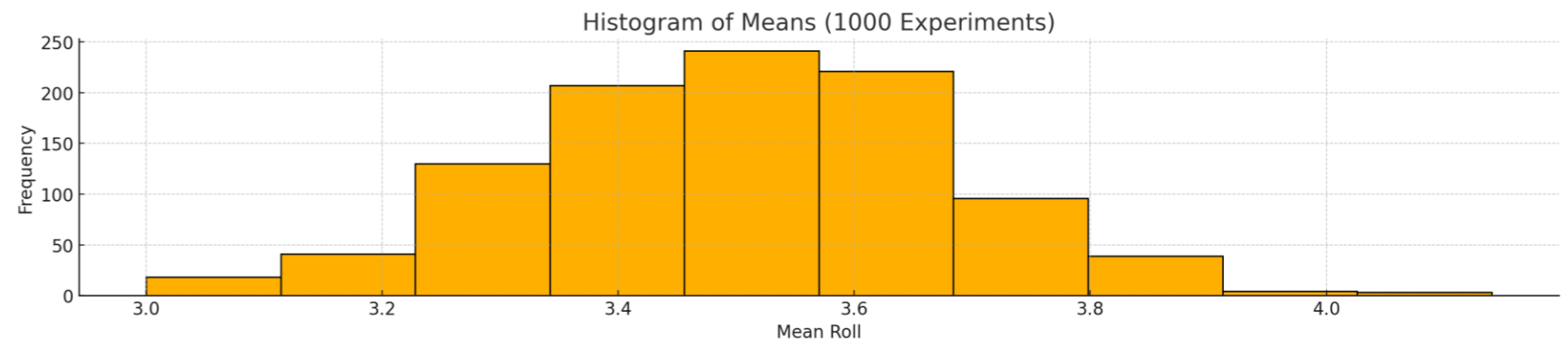
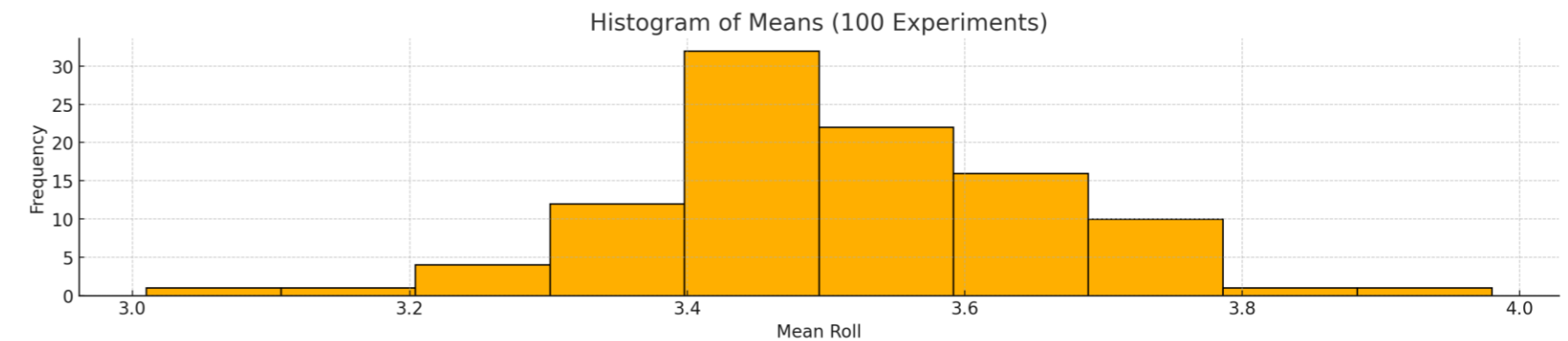
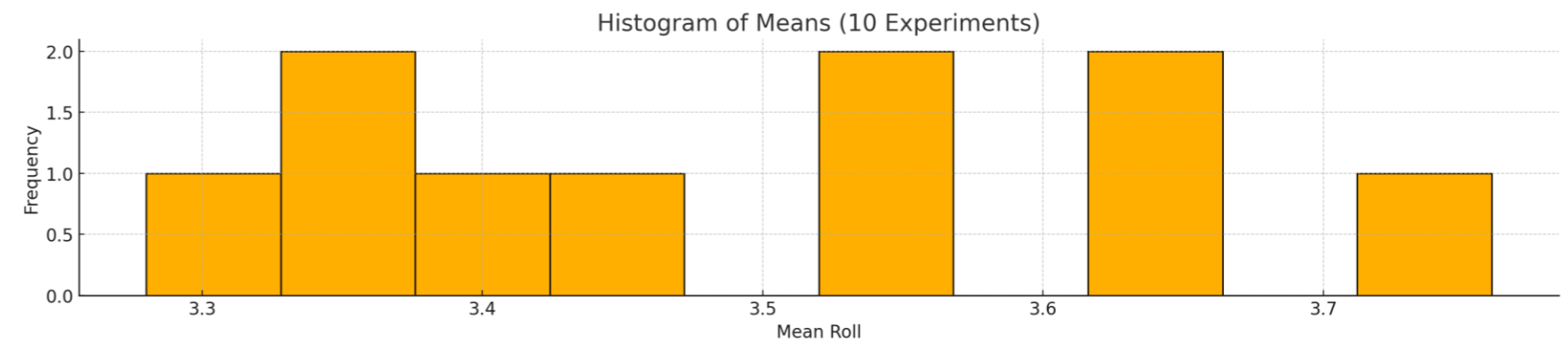
SOME EXAMPLES (3)

	A	B	
1	Dissertation Title	Year	
2	Unraveling the nexus between conceptualizations of the rural and the scaling up of agroecology: Insights from rural policy...	2024	
3	Sociocultural resilience of rural communities to extractive industries in Uganda's Albertine Graben	2024	
4	The Price of Sweetness: Consumer Behaviour and Willingness -To-Pay for Coconut Sugar in General Santos City, Philippines	2024	
5	Knowledge on agroecology disseminated by the FAO: Assessment from a human -nature relationship perspective	2024	
6	Cocoa Farm Business Succession: Determinants Influence Children to Continue or Leave Family's Cocoa Farm Business	2024	
7	The interlinkages between cooperative membership, food security and pro -social behaviour in low -income rural societies: the case...	2024	
8	An analysis of the efficiency of nitrogen policies in crop production in Flanders: an ex -ante assessment.	2023	
9	The Role of Social Enterprises in Improving Smallholder Farmer Households Livelihood Assets in Indonesia.	2023	
10	Analysis of herder -farmer conflict management policies in Benin.	2023	
11	Determinants of Market Participation among Milk Producers in Kyrgyzstan.	2023	
12	Determinants of Consistency in Farmers' Behavioral I Behavioral Intentions towards Bt -Eggplant Adoption in Bangladesh.	2023	
13	Evaluation of climate change resilience project in Uganda maize production field: sustainability and empowerment of smallhold er...	2023	
14	Policies Supporting Agroecological Transitions: Experiences of Three Public Programs in Mexico.	2023	
15	The Economic Effects of Covid -19 on Smallholder Farmers in Kenva.	2023	
16	Perceptions and local knowledge of the state, the changes and	The impact of international cooperation on rural producer organizations : case study of a dairy association in Bolivia	2008
17	An assessment of agri -environmental schemes for Peatland R	Role of governance in the diversification of rural economy / : analysis of two Ukrainian cases	2007
18	Eligibility of possible contact farms for targeted extension in w	Analysis of the effect of decentralization on responsiveness to local preferences in rural municipalities of Bolivia	2007
19	The sustainability of bee farming in Syria - main challenges and	The impact of transformation on socio -economic functioning of agricultural cooperatives in rural areas of Slovakia	2007
20	A Comparative Analysis of Food Accessibility and Determinant	Impact of the community initiative LEADER+ on the competitiveness of rural Greece : the case of Kavala	2007
		Institution of Land Property Rights and its influence on rural livelihood : an analysis of indigenous people in Western Ghat. ...	2007
		Institutional analysis of participatory development projects : a literature review	2007
		Biosphere reserves : contribution to sustainable local development? The case of Sierra Gorda Biosphere Reserve Queretaro, Mexico	2007
		Measuring the production and price instability in agriculture : a case of pulses in Bangladesh	2007
		Institutional implications of introducing multi -criteria analysis (MCA) in project planning : the case of thermal treatment of...	2007
		Survey of economic activities of Chinese migrants in the province of Luang Namtha of Lao PDR	2007
		Institutional analysis of water governance and management of irrigation schemes in Haïti	2007
		The role of women in the irrigated agriculture of southern Punjab, Pakistan	2007
		The liberalization and integration of rice markets in Bangladesh	2007
		The role of agriculture to reduce poverty in sub Sahara Africa : analysis of poverty reduction strategies with focus on...	2007

SOME EXAMPLES (4)

– Dice roll.

Roll a dice 100 times and compute the mean roll. Repeat this experiment 10 times and then plot a histogram of the means. Then perform the experiment again, but now 100 times. Plot the histogram of the means. Finally, perform the experiment 1000 times and plot the histogram of the means.



Analyseren ^

```
python

import numpy as np
import matplotlib.pyplot as plt

# Function to roll dice and compute means
def dice_experiment(num_rolls, num_experiments):
    means = [np.mean(np.random.randint(1, 7, size=num_rolls)) for _ in range(num_experiments)]
    return means

# Perform experiments
means_10 = dice_experiment(100, 10)
```

SOME EXAMPLES (5)

- Conduct (economic) experiments
- Simulate focus group discussions
- ...

I want to play the dictator game with 100 rural farmers. Can you take up the role of all 100 farmers with differing levels of inherent risk and a social network that connects them, and can I then conduct the experiment with you? I will first slowly guide you through the instructions. Can you also collect decision data?



Yes, I can simulate the behavior of 100 rural farmers with differing levels of inherent risk aversion and connections in a social network. I'll play the dictator game with you, allowing each "farmer" to act based on their assigned characteristics and connections. Additionally, I can collect and present decision data throughout the experiment.

Steps to Proceed:

1. **Guidance and Instructions:** You can guide me through the instructions for the game, and I'll ensure that the farmers comprehend and follow them.
2. **Farmer Profiles:** I'll generate 100 simulated farmers with varying levels of risk aversion and assign them positions in a social network. These levels will influence their decisions.
3. **Data Collection:** I'll keep a detailed record of decisions made by each farmer, including how

TAKEAWAYS (1)

- AI competence courses may focus on problem-oriented & solution-oriented thinking
 - Problem-oriented: identify problems and break them down into logical elements so AI can digest them
 - Solution-oriented: devise steps that may potentially lead to specific desired outcomes
- Similar to analytical and programming courses, but with reduced thresholds
 - Analytical and programming skills still allow you to reap more benefits
 - Improved knowledge of research methods strengthens tailored and suggestive instructions (less reliance on flexible instructions)

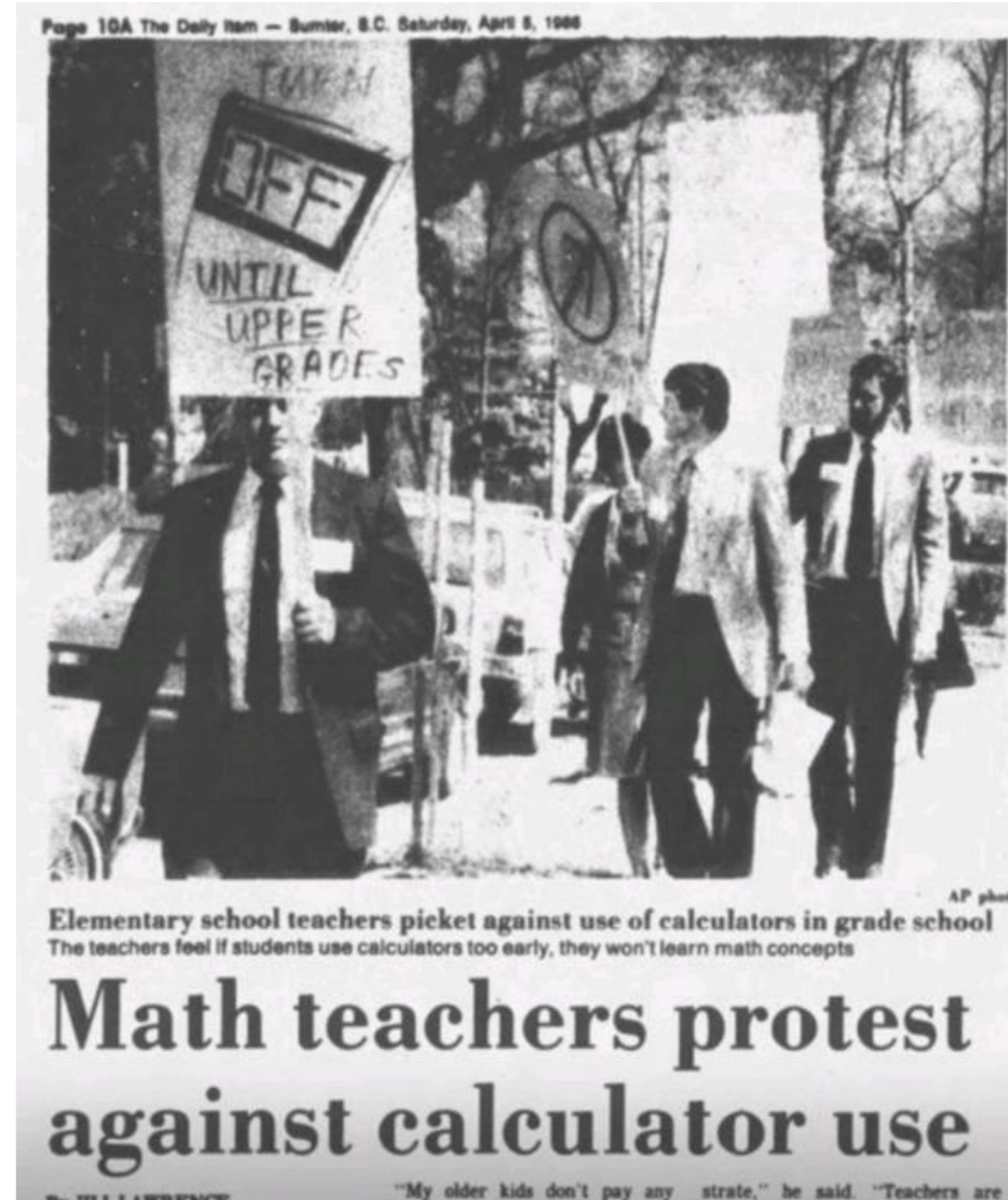
TAKEAWAYS (2)

- Understanding ChatGPT's Python integration is central
- Python knowledge is therefore recommended but not necessary (!)
- Translation to different programming languages

- My approach: nothing new, but incredibly time efficient and accessible
 - Allows students to interact with theory, modelling, and data
 - Allows teachers to integrate tangible cases
 - Allows researchers to experiment with multiple scenarios and hypotheses, contrast empirical versus theoretical data, and test research designs

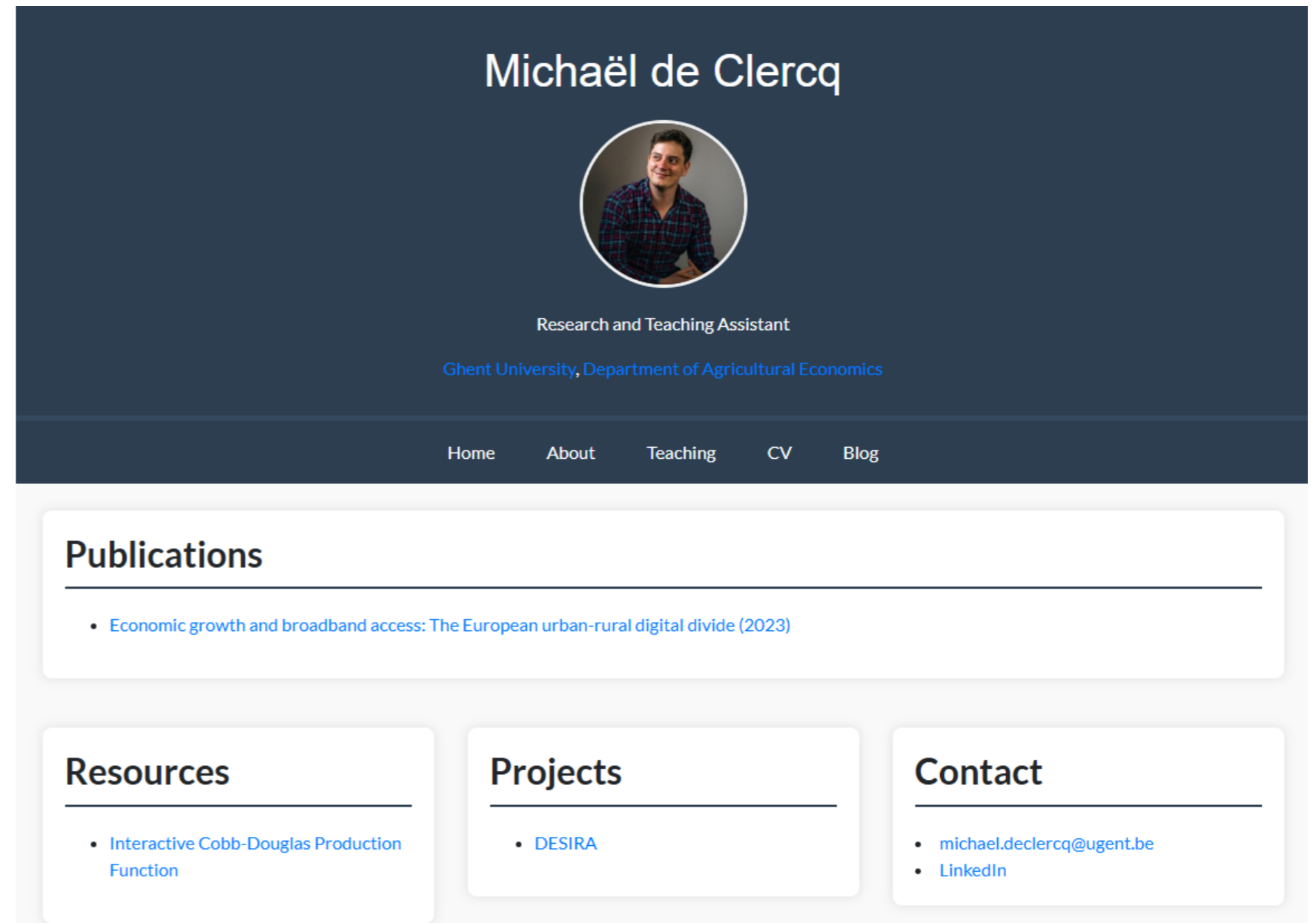
TAKEAWAYS (3)

- Efficiency
- Accessibility



CONTACT ME

- michael.declercq@ugent.be
- <https://users.ugent.be/~michdcle>
 - I will regularly upload more detailed examples on my webpage.
 - Send me your ideas!



The screenshot shows a personal webpage for Michael de Clercq. The header is dark blue with the name 'Michaël de Clercq' in white. Below the name is a circular profile picture of a man in a plaid shirt. Underneath the photo, it says 'Research and Teaching Assistant' and 'Ghent University, Department of Agricultural Economics'. A navigation menu at the bottom of the header includes 'Home', 'About', 'Teaching', 'CV', and 'Blog'. The main content area is white and features three sections: 'Publications' with one entry 'Economic growth and broadband access: The European urban-rural digital divide (2023)'; 'Resources' with one entry 'Interactive Cobb-Douglas Production Function'; and 'Projects' with one entry 'DESIRA'. A 'Contact' section at the bottom right lists 'michael.declercq@ugent.be' and 'LinkedIn'.