

Navigating the Programming Pathways

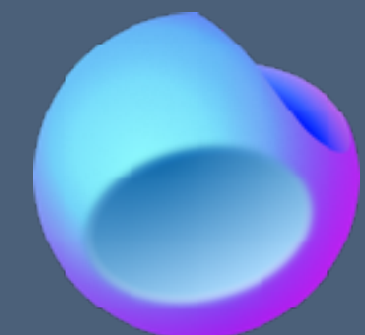
Guiding Students in Choosing and Mastering New Languages

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IOI, Alexandria, Egypt



Why I am talking about this

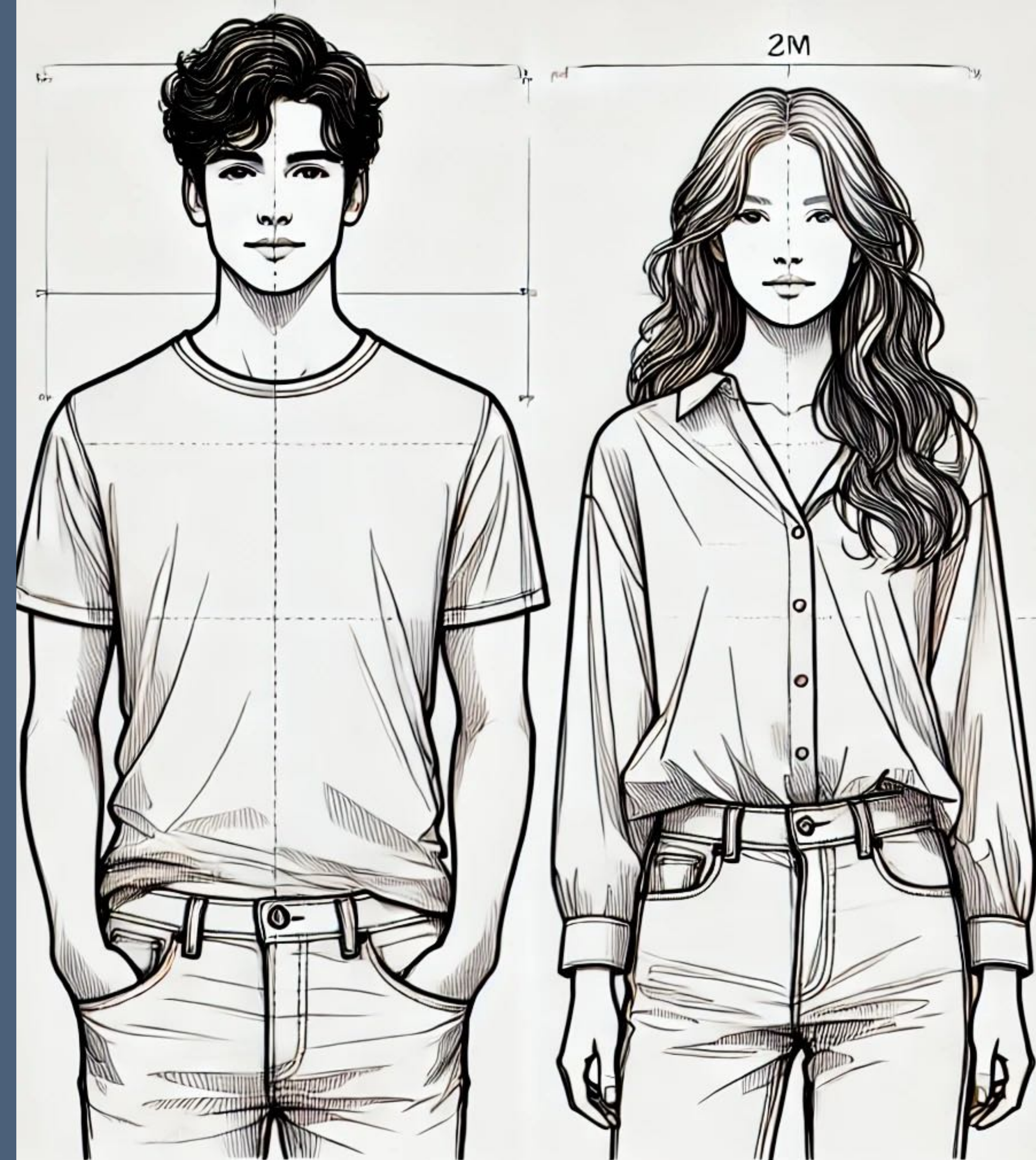
- I started teaching programming languages in **2000** (as a final year undergraduate student)
- I worked at universities until 2022, teaching about **20** different programming languages during my career
- I also worked with **kids** teaching them programming for **15 years**
- I wrote a book about **Haskell** (Haskell in Depth) and served as a Haskell language committee member
- As a developer advocate, I work with **RustRover** (Rust IDE) and **Fleet** (polyglot code editor)



A Journey Begins

The Starting Point

- They already use one or two languages (Python, C++)
- They might be experienced in algorithms and data structures
- They don't have a real-world experience with external libraries and frameworks
- They don't go deep in understanding language features or software development pipelines



Crossroads #1: Deepening or Broadening

Going deeper

Beware of 80/20 rule!



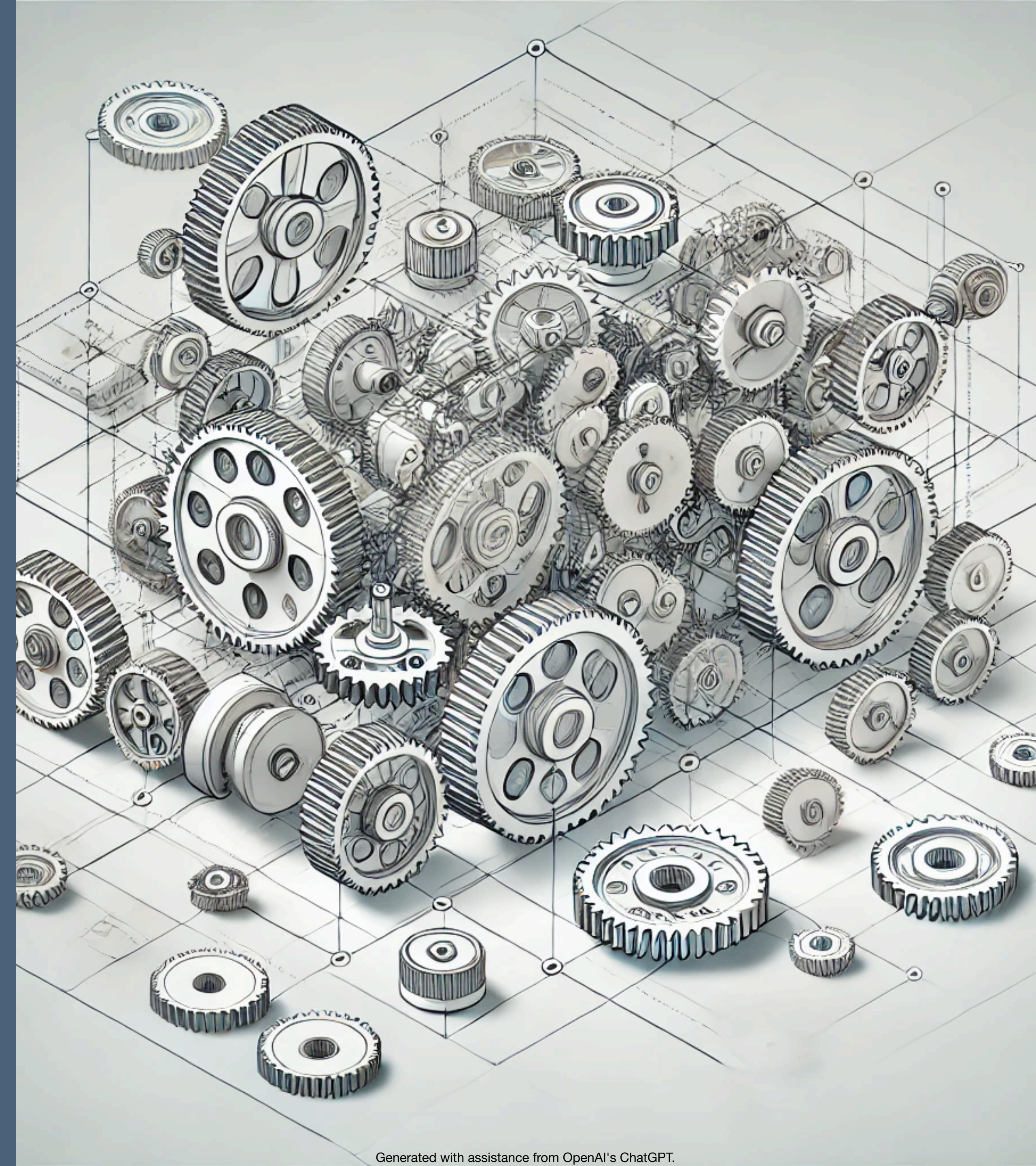
- Read books
 - Read code (watch [Marit van Dijk's talk on Reading code](#))
 - Read language specifications, formative references, language proposals, and discussions about them
 - Follow language designers
 - Experiment with language features (Go for "What if...")
 - Apply what you've learned
- **Note: This approach shortens a way to getting a job, but limits a number of appropriate vacancies**

Crossroads #2: Choosing a language to learn

Approach #1

Feature-driven exploration

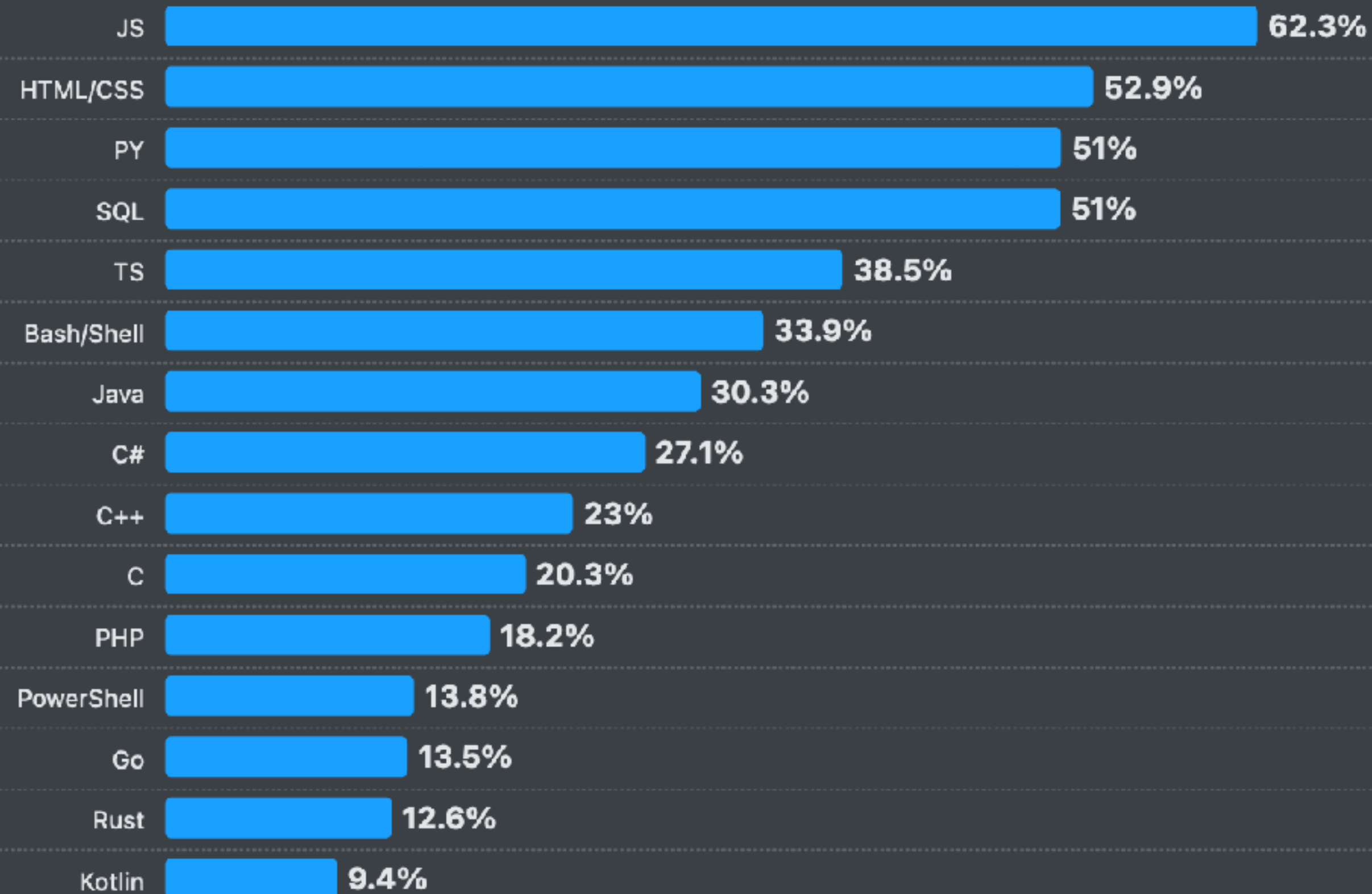
- Typing discipline
- Memory management
- Interpretation or compilation
- Primary programming style
- Concurrency models
- **Advice:** Choose languages from different bins
- Examples: Python → Java, C++ → Haskell



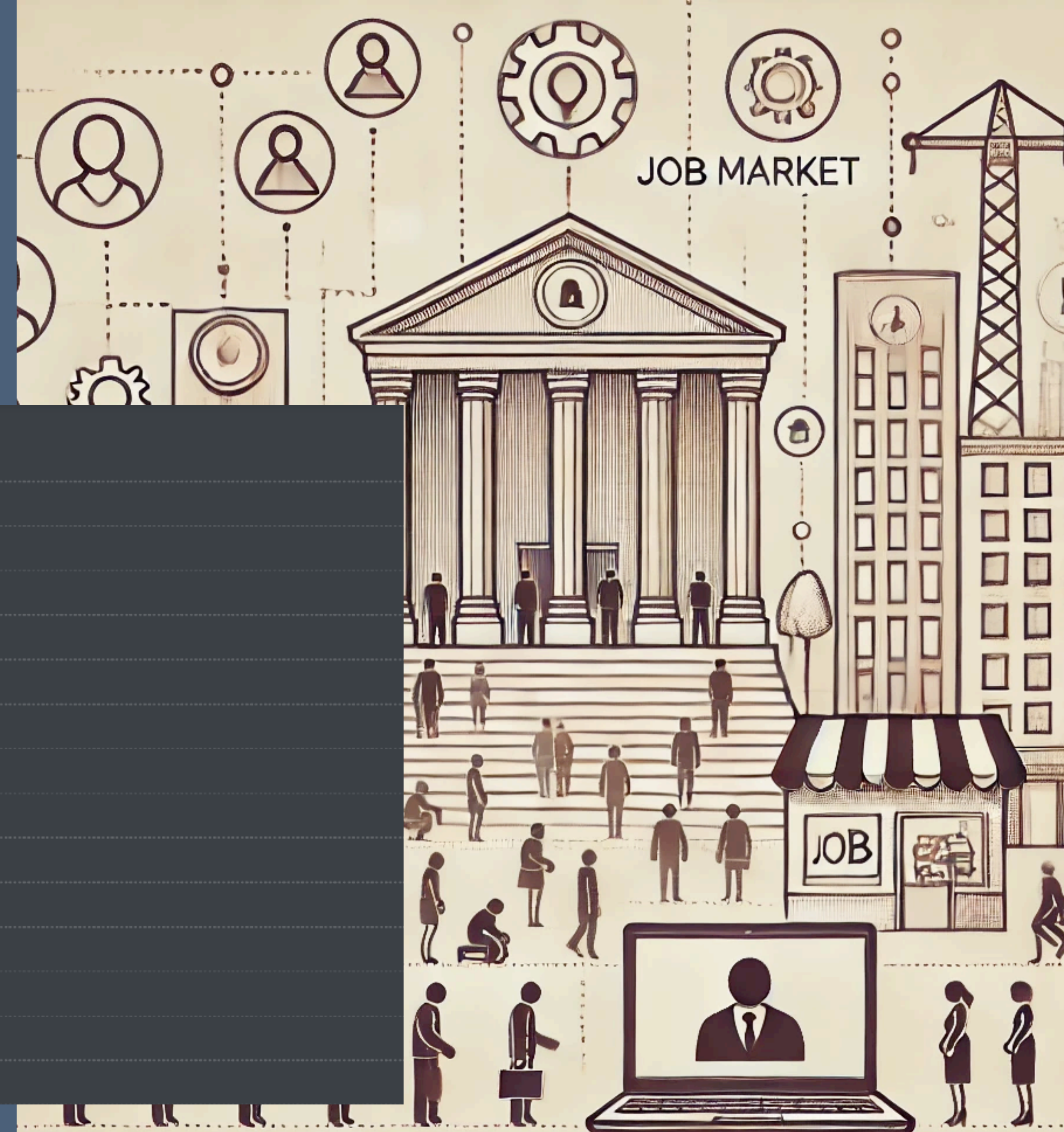
Approach #2

Job Market Considerations

StackOverflow Developer Survey, 2024



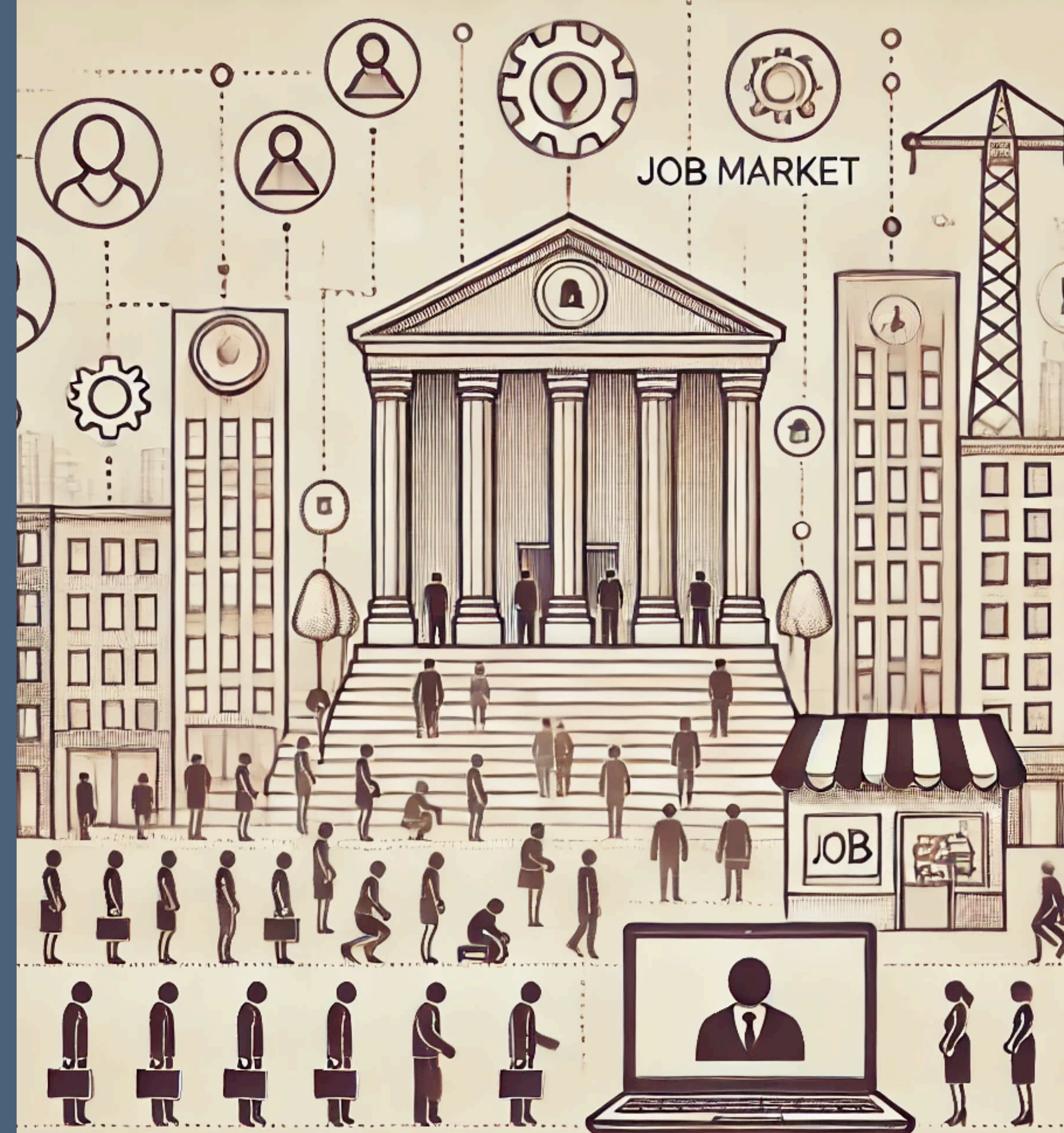
Most used languages



Approach #2

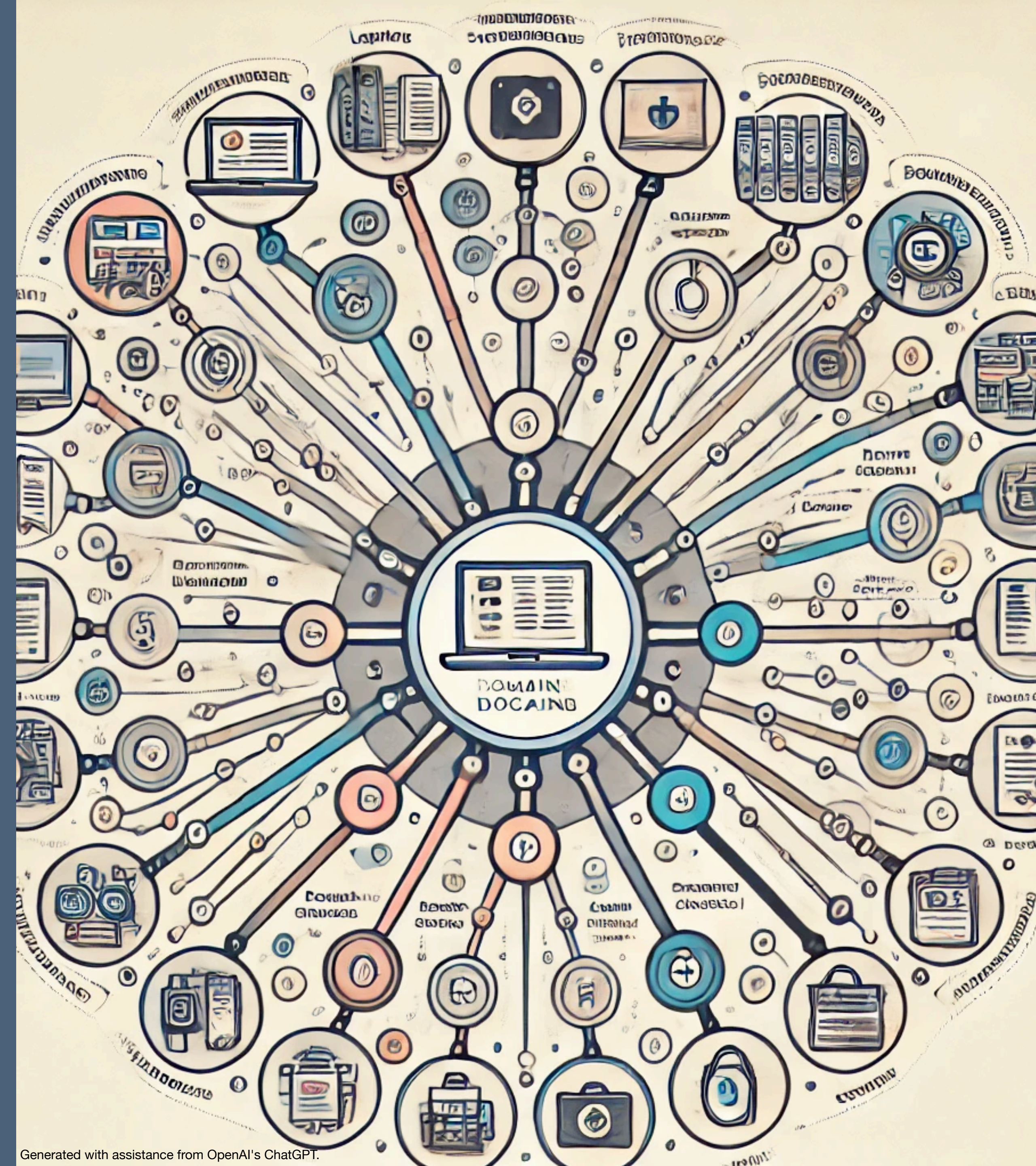
Job Market Considerations

- **Advice:** keep learning diverse skills as the industry evolves rapidly
- **Advice:** don't follow this approach too early in your career



Domain-Specific Choices

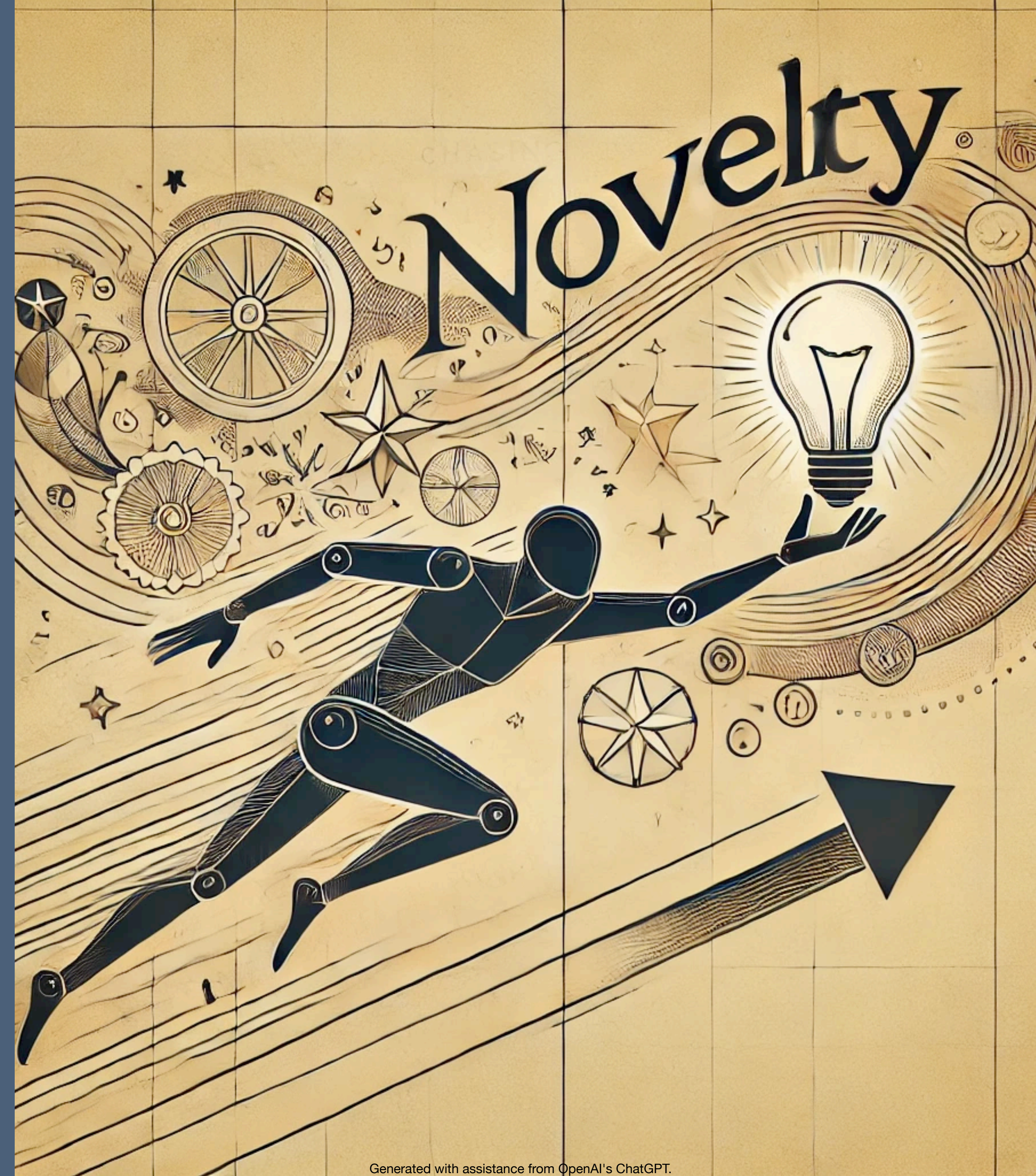
- If you want to work in **<APPLICATION DOMAIN>**, then try **<LANGUAGE>** (or **<LANGUAGE_SET>**)
- Examples:
 - **Rust** for systems programming
 - **C#** for game development
 - **Java** for enterprise systems
- Application domains are less likely to be outdated than languages, but there's a risk to get bored early
- New domains emerge very often
- **Advice:** follow with care, there's a risk of burnouts



Approach #4

Chasing Novelty

- Be excited with new and emerging languages with small but passionate communities
- Explore fresh ideas in language design
- Look at **Zig**, or **Mojo**, or **Verse**, or...
- **Advice**: it's fun and rewarding, but risky (no jobs, the language might die soon)



Balancing choices and
approaches over time is vital

Mastering a New Language

Practical Tips

- Finding help (documentation, community groups, AI, books, online courses)
- Understanding general concepts
- Exploring language features
- Utilising external libraries
- Applying professional tooling
- Using project-based learning
- Solving real-world problems



JETBRAINS Academy

- JetBrains Academy Course Catalog:
<https://academy.jetbrains.com/>
- In-IDE learning experience
- Concept maps (knowledge graphs)
- Project-based learning

Learn to write code
by writing code

Recap

My Advice

- Broaden and deepen
- Try languages with different concepts and features
- Don't start thinking about career perspectives and salaries too early
- Don't limit yourself with application domains (at least in the beginning)
- Try at least one emerging language
- Think about balancing your choices
- Always be writing code



- **Discussion Session:**
«Should companies help the teacher community and how?»,
September 5th, 9:00-11:00
- **JetBrains Booth:**
 - September 3rd, 10.00-14.00
 - September 4th, 18.00-23.59
 - September 5th, 15.00-18.00
 - September 7th, 10.00-22.00

Please, join us!

