Exploring the Effect of Multiple Natural Languages on Code Suggestion Using GitHub Copilot

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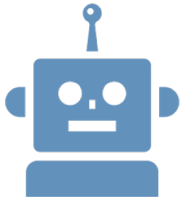
Background: Development using AI



GitHub Copilot (Coding Support)

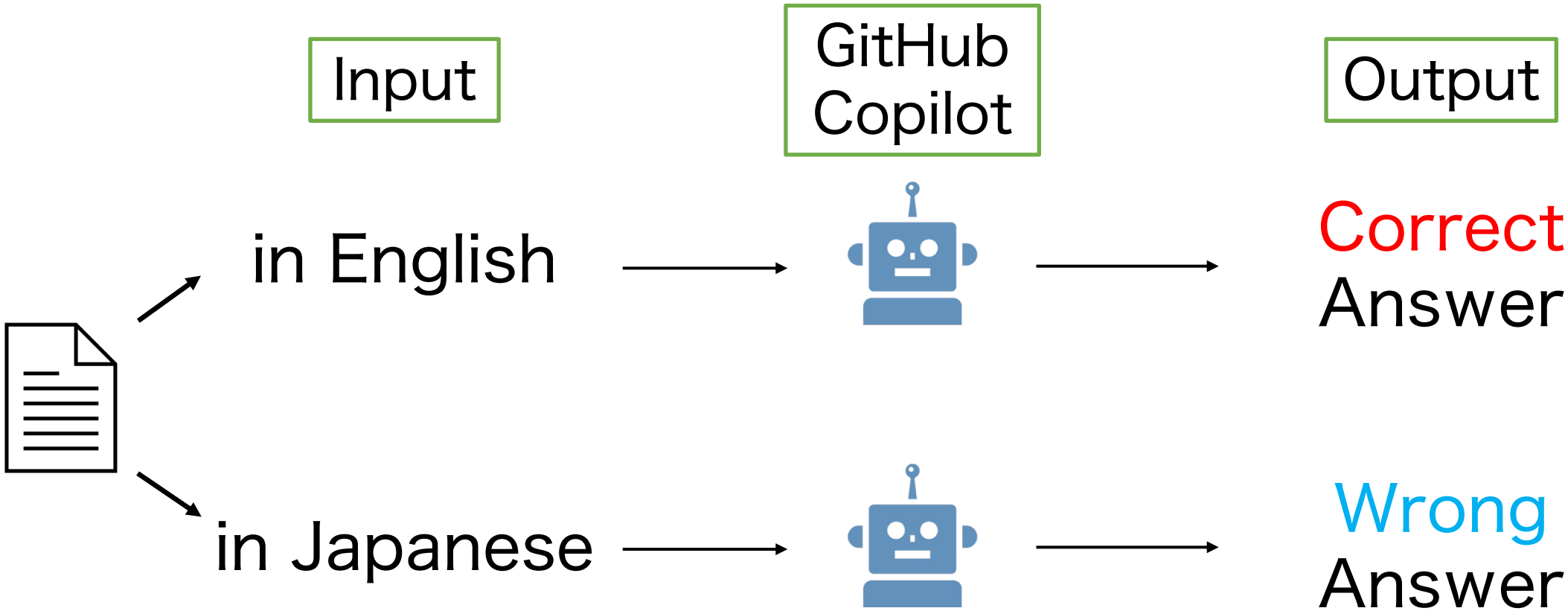
```python
import datetime

def parse_expenses(expenses_string):
    """Parse the list of expenses and return the list of triples (date, value, currency).
    Ignore lines starting with #.
    Parse the date using datetime.
    Example expenses_string:
        2016-01-02 -34.01 USD
        2016-01-03 2.59 DKK
        2016-01-03 -2.72 EUR
    """
    expenses = []
    for line in expenses_string.splitlines():
        if line.startswith("#"):
            continue
        date, value, currency = line.split(" ")
        expenses.append((datetime.datetime.strptime(date, "%Y-%m-%d"),
                         float(value),
                         currency))
    return expenses
```

Copilot

Input

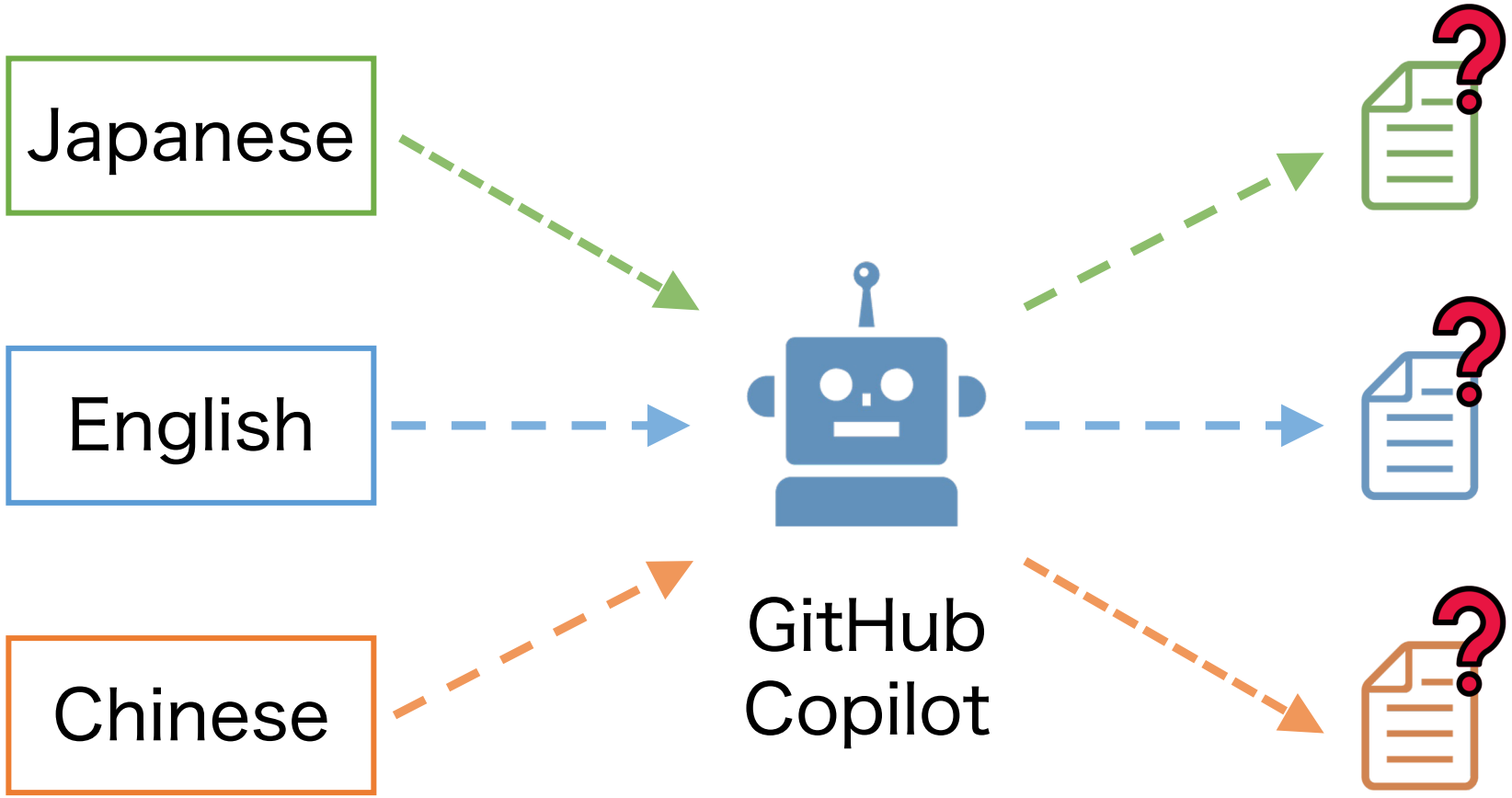
Recommendation

Background: The effect of input language



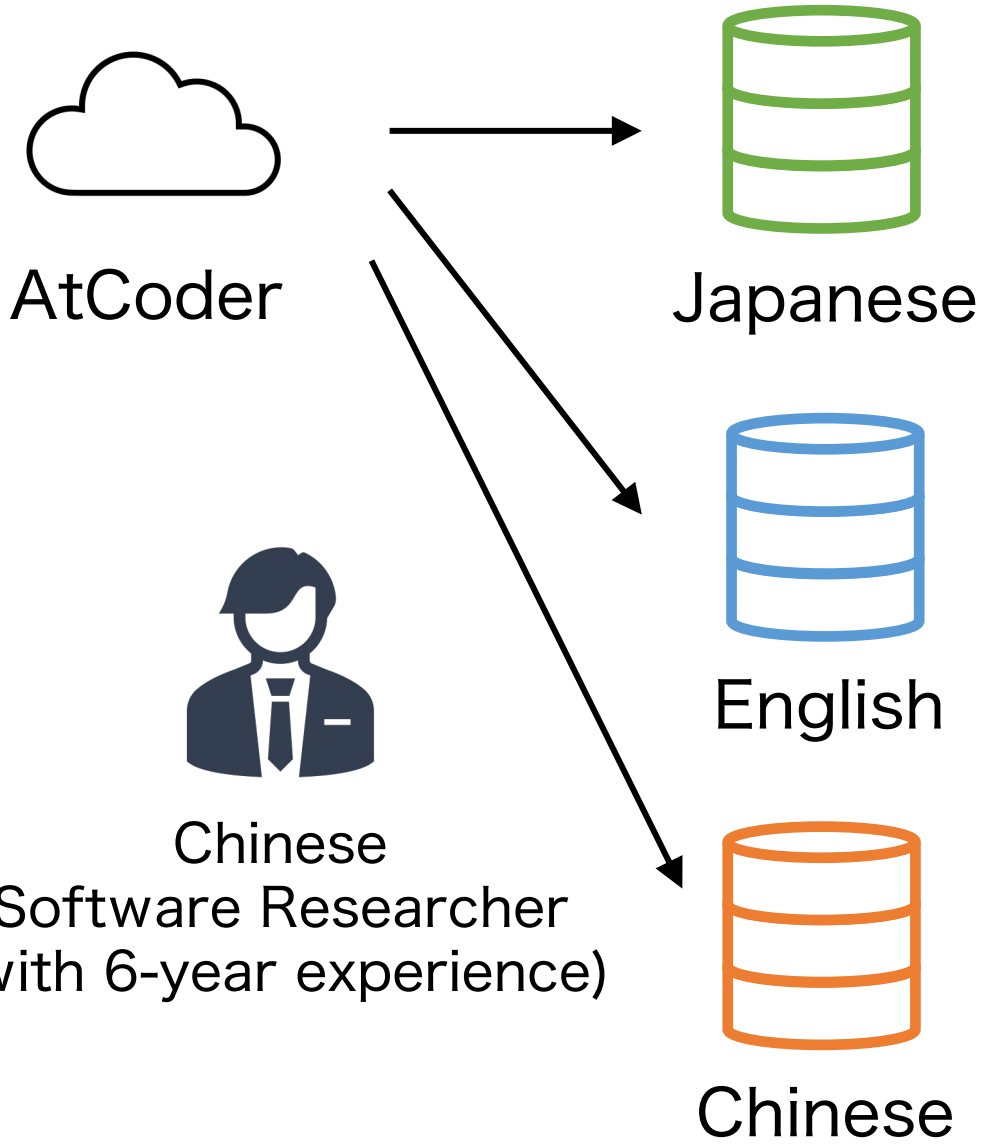
We should give appropriate input to use AI efficiently.

Goal: Understand how language differences affect GitHub Copilot performance

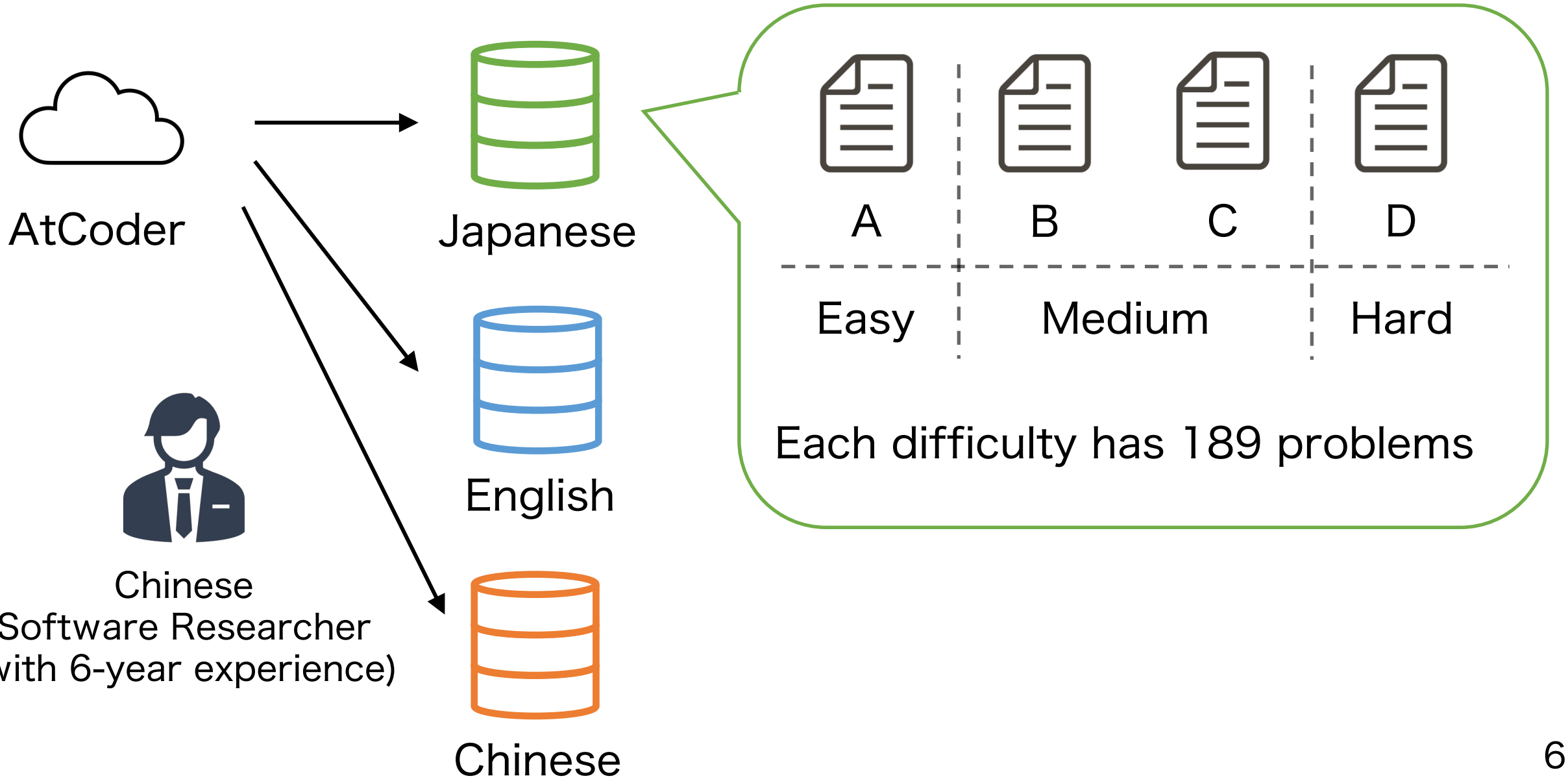


Which language is the best?

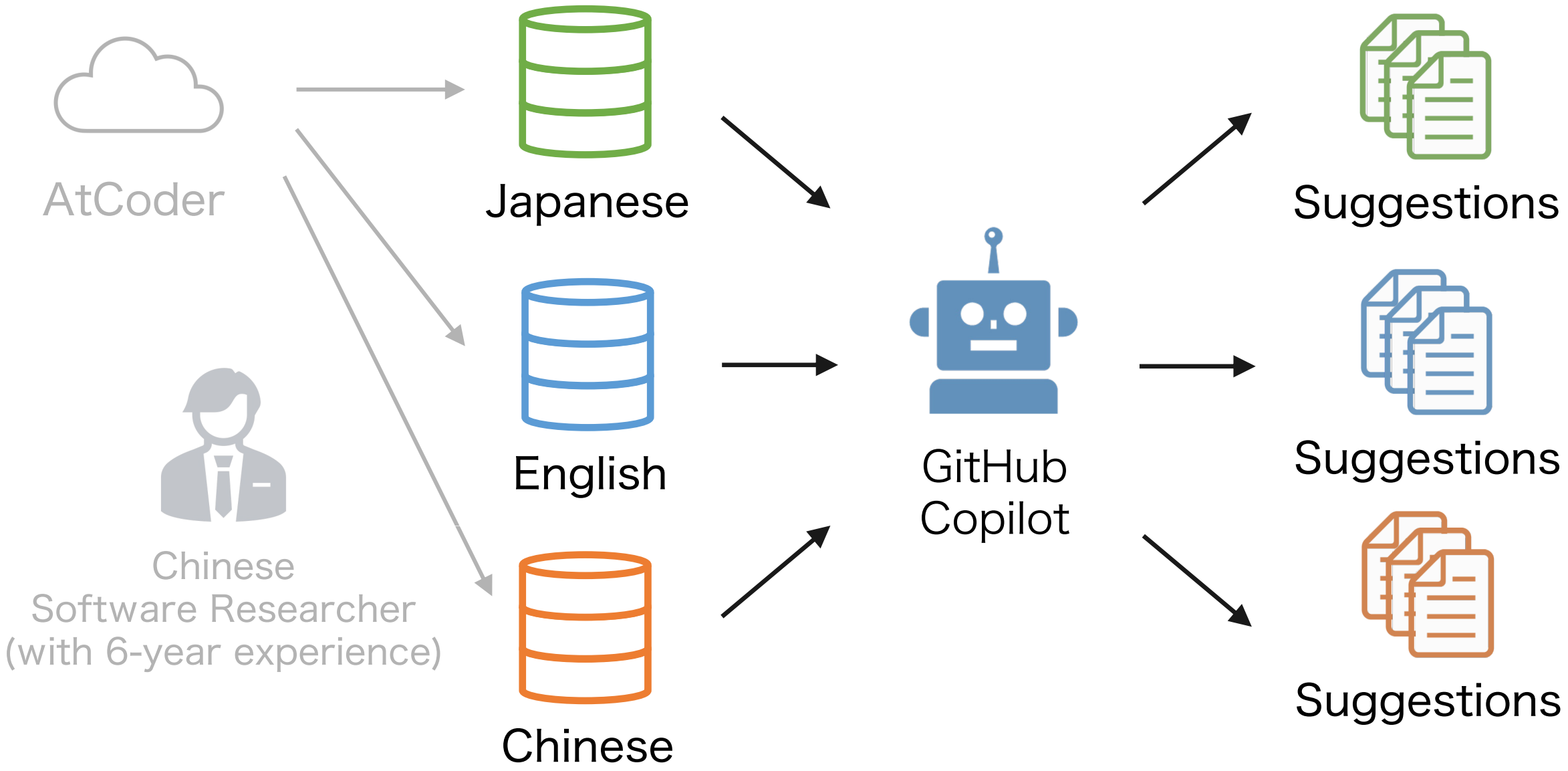
Experiment


AtCoder
Japanese
English
Chinese
Chinese
Software Researcher
(with 6-year experience)

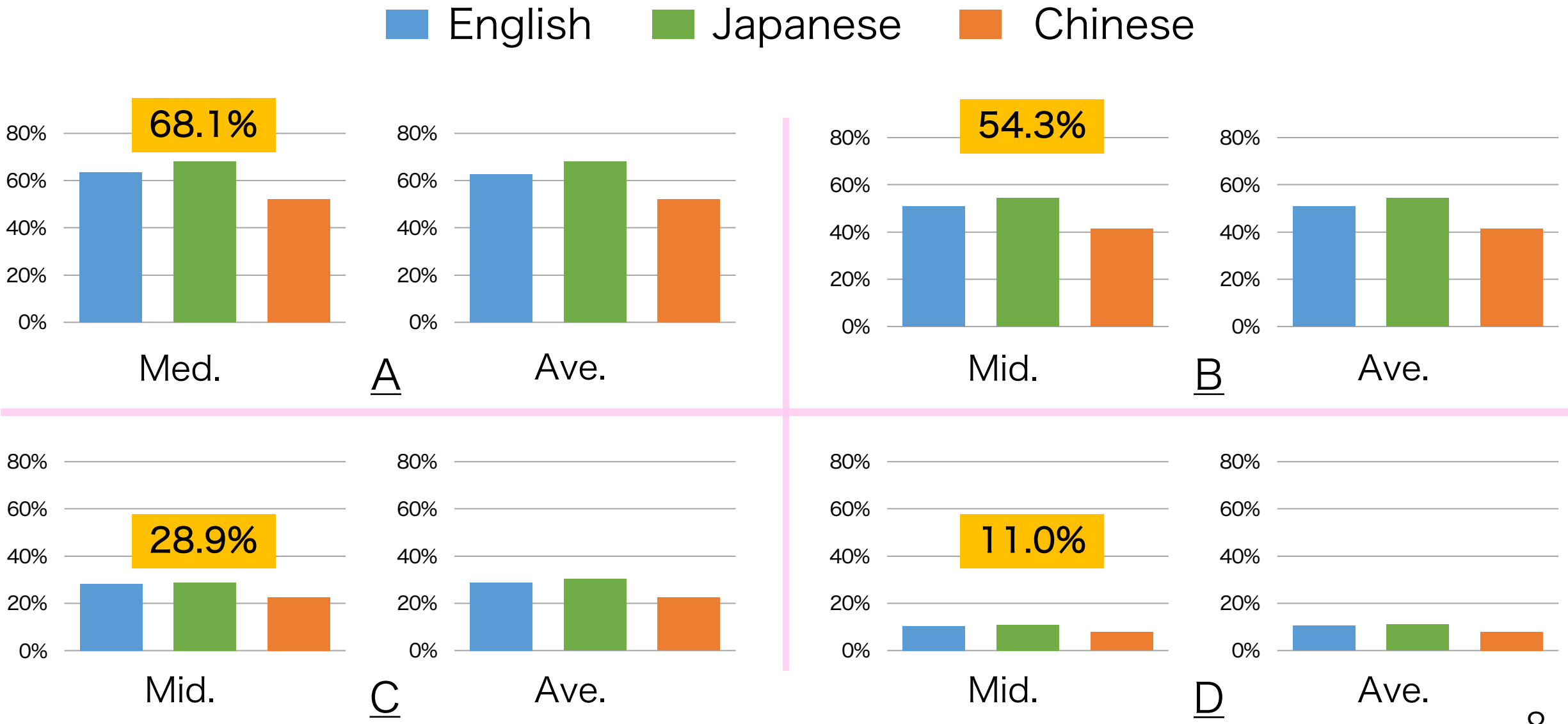
Experiment


AtCoder
Japanese
English
Chinese
Chinese
Software Researcher
(with 6-year experience)
A
B
C
D
Easy
Medium
Hard
Each difficulty has 189 problems

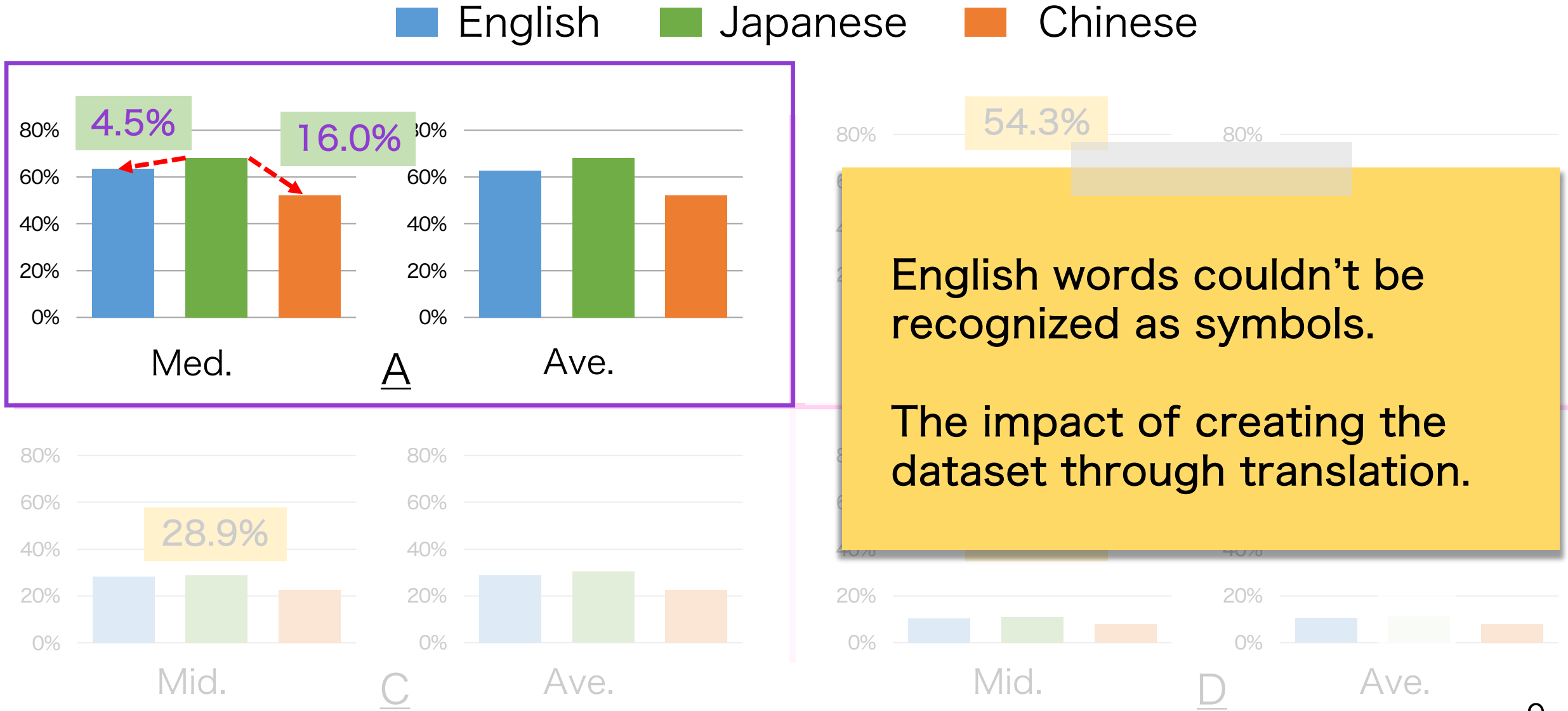
Experiment


AtCoder
Chinese
Software Researcher
(with 6-year experience)
Japanese
English
Chinese
GitHub
Copilot
Suggestions
Suggestions
Suggestions

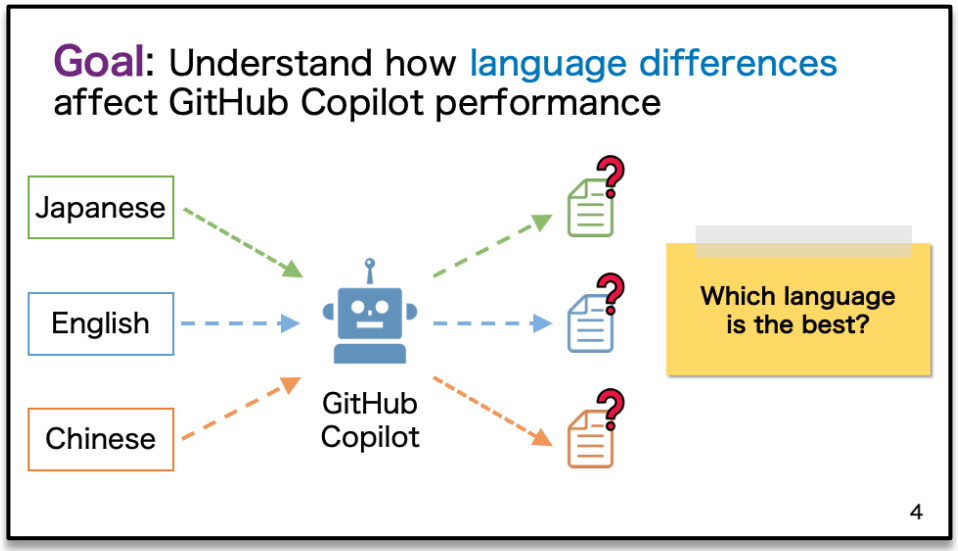
Results: Japanese recorded the highest *Accuracy*

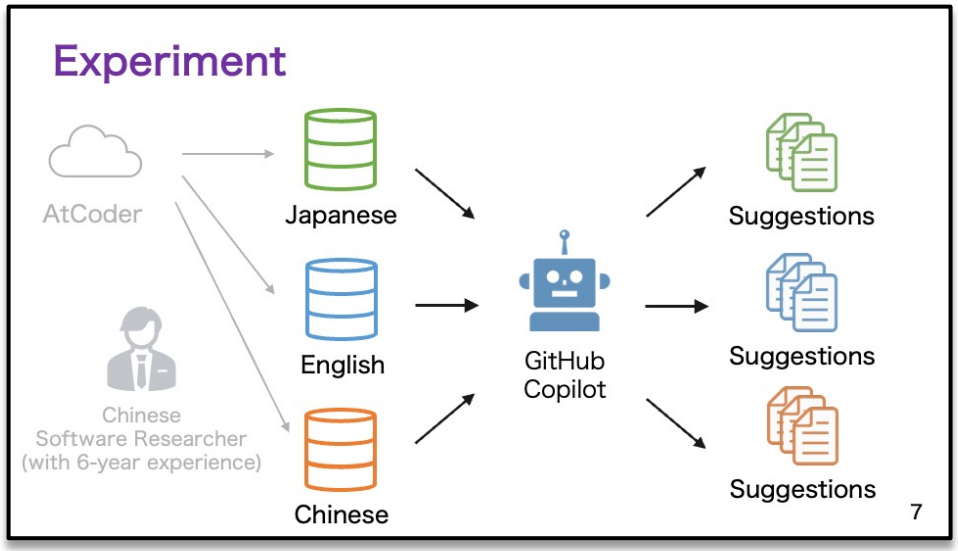


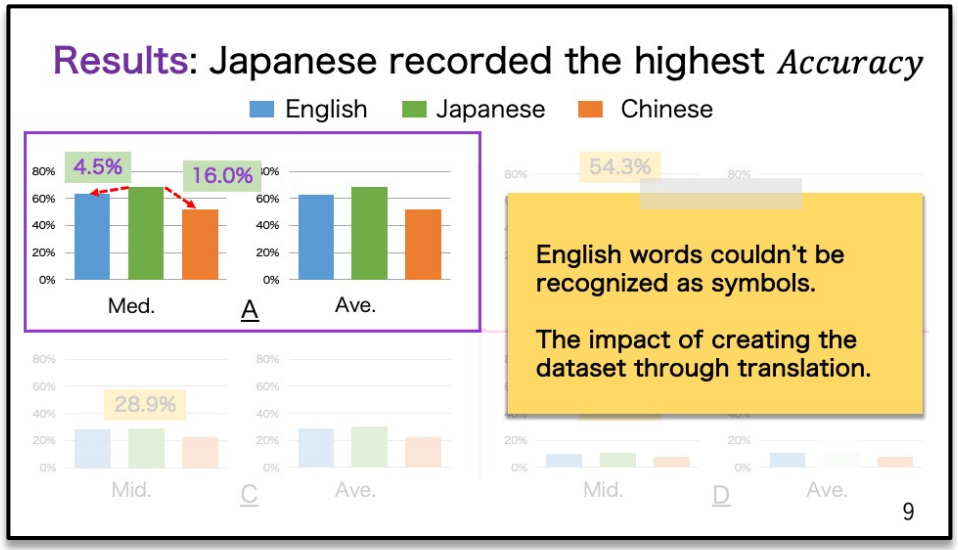
Results: Japanese recorded the highest *Accuracy*



Summary: The capability varies across natural languages.







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