

Agent-driven Code Recommendation Service (ACRS) using AutoGen and LASSO

Team Project

**Chair of Software Engineering (Prof. Atkinson) &
Chair of Web-based Systems (Prof. Bizer)**

Fall Semester 2024



An Agent-driven Code Recommendation Service

- Summary
 - Develop an AI-driven, agent-based service that provides personalized code recommendations based on analysis of large numbers of software implementations, mimicking the functionality of LASSO's analysis pipeline (LSL)
- Project involves
 - **Agents:** Use autonomous software agents to drive the code search process
 - **Generative AI:** Use of LLMs to enable conversations and perform tasks
 - **Code Search:** The primary focus is on searching for *relevant* code snippets or implementations
 - **Services:** The provision of a service-oriented agent framework that offers code recommendation capabilities
- Technology Components
 - LASSO platform: automate the gathering and analysis (including static and dynamic analysis) of large numbers of harvested software implementations (<https://github.com/SoftwareObservatorium/lasso>)
 - LLMs for Software Engineering tasks + LangChain: AI toolkit for integration (<https://www.langchain.com/langchain>)
 - AutoGen: agent framework (<https://microsoft.github.io/autogen/>)



LASSO Platform – Code Search Service

LSL Analysis Pipelines

	A	B	C	D
1	instance	create	Queue	
2		push	A1	"hello world"
3	"hello world"	peek	A1	
4		size	A1	
5	"hello world"	pop	A1	
6		size	A1	

LASSO Observatorium

**Code
(data sources ...)**

1) Query



Interface Signature
Specify your interface in LQL

Clear

```

1 Queue {
2   enqueue(Object) -> Object
3   dequeue() -> Object
4   peek() -> Object
5   size() -> int
6 }

```

Sequence Sheets
Specify one or more Sequence Sheets

Sheet 1

	A	B	C	D	E
1		create	Queue		
2		enqueue	A1	"hello"	
3		enqueue	A1	"world"	
4	"hello"	peek	A1		
5	2	size	A1		
6	"hello"	dequeue	A1		
7	1	size	A1		

Add Row Add Column New Sheet Load Export

Settings
Fine-tune parameters

2) Manually pick best match (preferences)

Results for LSL Pipeline
1ba2d2e3-666f-4bb0-8707-68cc4d1d7bb0

<> View LSL Script SRM Database

Items per page: 25 1 - 25 of 475

#1 org.mortbay.util.ArrayQueue²⁵
org.mortbay.jetty-util:5.6.1.26

Interface Code Responses Operations Stimuli Observations Reports

```

1 ArrayQueue {
2   ArrayQueue ()
3   ArrayQueue (int)
4   ArrayQueue (int, int)
5   ArrayQueue (int, int, java.lang object)
6
7   getCapacity () -> int
8   add (java.lang object) -> boolean
9   offer (java.lang object) -> boolean

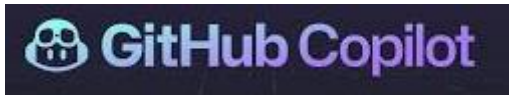
```

LLMs – Code Generation

LLMs (chatbots) trained on massive amounts of open source code



GPT-*



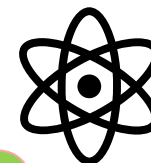
... many more



generate a java method
that serializes an object
to a string using JSON



Here's an example Java
method,
serializeToJsonString,
....



...

....



ACRS – Multi-Agent Code Recommendation (1)

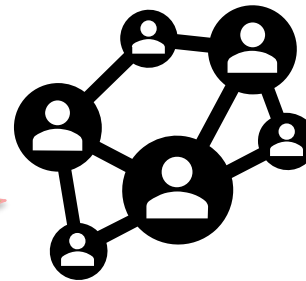


Recommend a Java method that serializes an object to JSON. Pick the best match based on minimal cyclomatic complexity and project popularity.

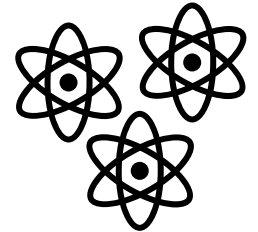
The best match is Java method, toJson,

In addition to cyclomatic complexity, also consider X and Y ...

....



Agents



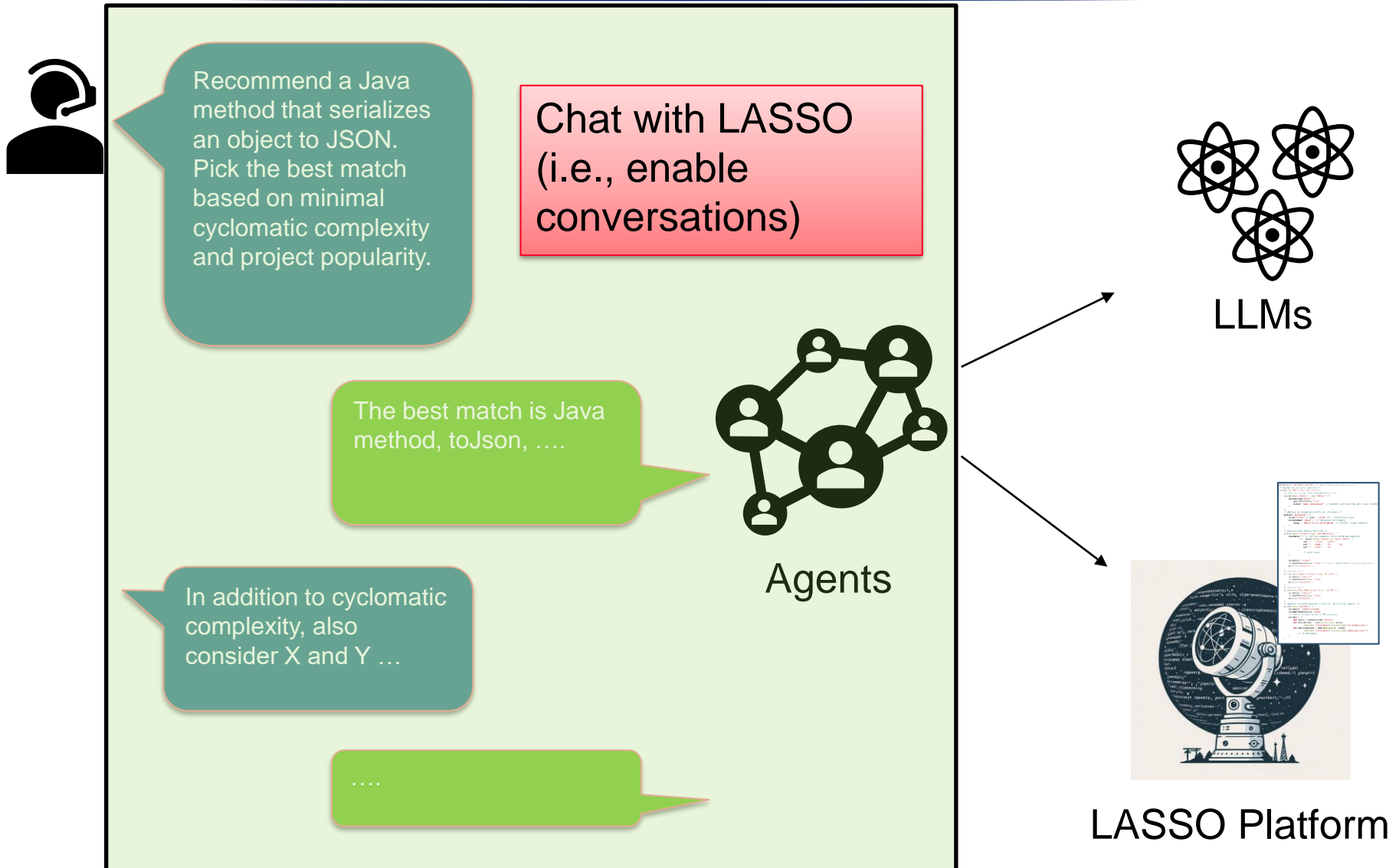
LLMs



LASSO Platform



ACRS – Multi-Agent Code Recommendation (2)



ACRS – Multi-Agent Code Recommendation (3)

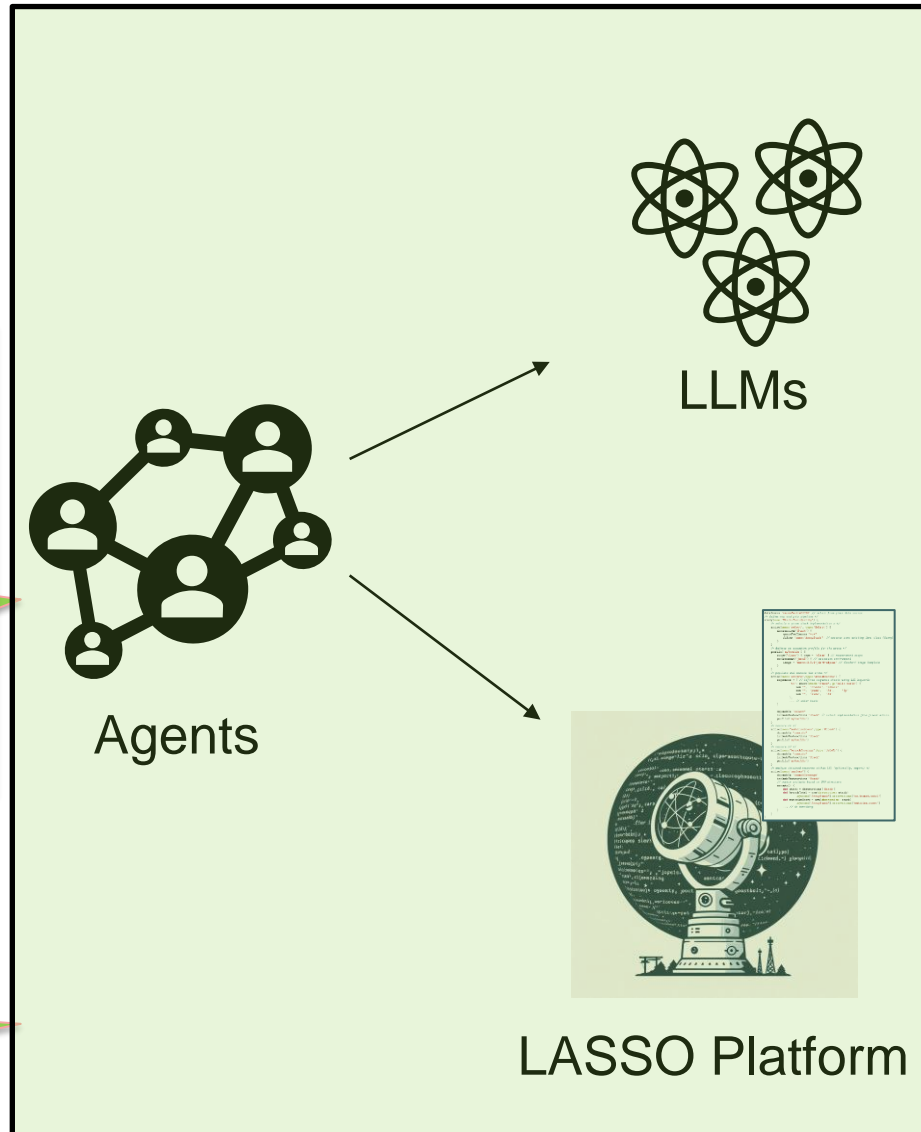


Recommend a Java method that serializes an object to JSON. Pick the best match based on minimal cyclomatic complexity and project popularity

- AutoGen: agents + LLM workflows
- LangChain: use LASSO's platform services to retrieve "code", "facts" (e.g., metrics) and use analysis "tools" (e.g., execute and analyze code)

complexity, also consider X and Y ...

....



Requirements

- Participants
 - 4-6 students
- Length
 - 6 months
- Prerequisites
 - Python and/or Java programming skills
 - Basic understanding of machine learning
 - Ideally, IE 686 Large Language Models and Agents
- Language
 - English
- Organisation
 - Goals and timetable defined by agreement with the supervisor
- Applicable to MMDS: yes
- Online: By agreement
- Main Supervisor
 - Marcus Kessel
- Technical Supervisor (Agents)
 - Ralph Peeters

