Modules Agents Agent types OpenAI Multi Functions Agent

OpenAI Multi Functions Agent

This notebook showcases using an agent that uses the OpenAI functions ability to respond to the prompts of the user using a Large Language Model

Install openai,google-search-results packages which are required as the langchain packages call them internally

> pip install openai google-search-results

```
from langchain import SerpAPIWrapper
from langchain.agents import initialize_agent, Tool
from langchain.agents import AgentType
from langchain.chat_models import ChatOpenAI
```

API Reference:

- initialize_agent from `langchain.agents`
- Tool from `langchain.agents`
- AgentType from `langchain.agents`
- ChatOpenAI from `langchain.chat_models`

The agent is given ability to perform search functionalities with the respective tool

SerpAPIWrapper:

> This initializes the SerpAPIWrapper for search functionality (search).

```
import getpass
import os

os.environ["SERPAPI_API_KEY"] = getpass.getpass()
```

```
    ········
```

```
# Initialize the OpenAI language model
# Replace <your_api_key> in openai_api_key="<your_api_key>" with your
actual OpenAI key.
llm = ChatOpenAI(temperature=0, model="gpt-3.5-turbo-0613")

# Initialize the SerpAPIWrapper for search functionality
# Replace <your_api_key> in openai_api_key="<your_api_key>" with your
actual SerpAPI key.
search = SerpAPIWrapper()

# Define a list of tools offered by the agent
tools = [
    Tool(
        name="Search",
        func=search.run,
        description="Useful when you need to answer questions about
current events. You should ask targeted questions.",
    ),
]
```

```
mrkl = initialize_agent(
    tools, llm, agent=AgentType.OPENAI_MULTI_FUNCTIONS, verbose=True
)
```

```
# Do this so we can see exactly what's going on under the hood
import langchain

langchain.debug = True
```

```
mrkl.run("What is the weather in LA and SF?")
```

```
    [chain/start] [1:chain:AgentExecutor] Entering Chain run with input:
    {
      "input": "What is the weather in LA and SF?"
    }
    [llm/start] [1:chain:AgentExecutor > 2:llm:ChatOpenAI] Entering LLM
run with input:
    {
      "prompts": [
        "System: You are a helpful AI assistant.\nHuman: What is the
weather in LA and SF?"
      ]
    }
    [llm/end] [1:chain:AgentExecutor > 2:llm:ChatOpenAI] [2.91s] Exiting
LLM run with output:
    {
      "generations": [
        [
          {
            "text": "",
            "generation_info": null,
            "message": {
              "content": "",
              "additional_kwargs": {
                "function_call": {
                  "name": "tool_selection",
                  "arguments": "{\n  \"actions\": [\n    {\n
\"action_name\": \"Search\",\n      \"action\": {\n        \"tool_input\":
\"weather in Los Angeles\"\n      }\n    },\n    {\n      \"action_name\":
\"Search\",\n      \"action\": {\n        \"tool_input\": \"weather in San
Francisco\"\n      }\n    }\n  ]\n}"
                }
              },
              "example": false
            }
          }
        ]
      ],
      "llm_output": {
        "token_usage": {
          "prompt_tokens": 81,
          "completion_tokens": 75,
          "total_tokens": 156
        },
        "model_name": "gpt-3.5-turbo-0613"
      },
      "run": null
    }
    [tool/start] [1:chain:AgentExecutor > 3:tool:Search] Entering Tool run
with input:
    "{'tool_input': 'weather in Los Angeles'}"
    [tool/end] [1:chain:AgentExecutor > 3:tool:Search] [608.693ms] Exiting
```

```
Tool run with output:
    "Mostly cloudy early, then sunshine for the afternoon. High 76F. Winds
SW at 5 to 10 mph. Humidity59%."
    [tool/start] [1:chain:AgentExecutor > 4:tool:Search] Entering Tool run
with input:
    "{'tool_input': 'weather in San Francisco'}"
    [tool/end] [1:chain:AgentExecutor > 4:tool:Search] [517.475ms] Exiting
Tool run with output:
    "Partly cloudy this evening, then becoming cloudy after midnight. Low
53F. Winds WSW at 10 to 20 mph. Humidity83%."
    [llm/start] [1:chain:AgentExecutor > 5:llm:ChatOpenAI] Entering LLM
run with input:
    {
      "prompts": [
        "System: You are a helpful AI assistant.\nHuman: What is the
weather in LA and SF?\nAI: {'name': 'tool_selection', 'arguments': '{\\n
\"actions\": [\\n    {\\n      \"action_name\": \"Search\",\\n
\"action\": {\\n        \"tool_input\": \"weather in Los Angeles\"\\n
}\\n    },\\n    {\\n      \"action_name\": \"Search\",\\n
\"action\": {\\n        \"tool_input\": \"weather in San Francisco\"\\n
}\\n    }\\n  ]\\n}'}\nFunction: Mostly cloudy early, then sunshine for
the afternoon. High 76F. Winds SW at 5 to 10 mph. Humidity59%.\nAI:
{'name': 'tool_selection', 'arguments': '{\\n  \"actions\": [\\n    {\\n
\"action_name\": \"Search\",\\n      \"action\": {\\n
\"tool_input\": \"weather in Los Angeles\"\\n      }\\n    },\\n    {\\n
\"action_name\": \"Search\",\\n      \"action\": {\\n
\"tool_input\": \"weather in San Francisco\"\\n      }\\n    }\\n
]\\n}'}\nFunction: Partly cloudy this evening, then becoming cloudy after
midnight. Low 53F. Winds WSW at 10 to 20 mph. Humidity83%."
      ]
    }
    [llm/end] [1:chain:AgentExecutor > 5:llm:ChatOpenAI] [2.33s] Exiting
LLM run with output:
    {
      "generations": [
        [
          {
            "text": "The weather in Los Angeles is mostly cloudy with a
high of 76°F and a humidity of 59%. The weather in San Francisco is partly
cloudy in the evening, becoming cloudy after midnight, with a low of 53°F
and a humidity of 83%.",
            "generation_info": null,
            "message": {
              "content": "The weather in Los Angeles is mostly cloudy with
a high of 76°F and a humidity of 59%. The weather in San Francisco is
partly cloudy in the evening, becoming cloudy after midnight, with a low
of 53°F and a humidity of 83%.",
              "additional_kwargs": {},
              "example": false
            }
          }
        ]
      ],
      "llm_output": {
        "token_usage": {
          "prompt_tokens": 307,
          "completion_tokens": 54,
          "total_tokens": 361
        },
        "model_name": "gpt-3.5-turbo-0613"
      },
      "run": null
    }
    [chain/end] [1:chain:AgentExecutor] [6.37s] Exiting Chain run with
output:
    {
      "output": "The weather in Los Angeles is mostly cloudy with a high
of 76°F and a humidity of 59%. The weather in San Francisco is partly
cloudy in the evening, becoming cloudy after midnight, with a low of 53°F
and a humidity of 83%."
    }





    'The weather in Los Angeles is mostly cloudy with a high of 76°F and a
humidity of 59%. The weather in San Francisco is partly cloudy in the
evening, becoming cloudy after midnight, with a low of 53°F and a humidity
of 83%.'
```

Configuring max iteration behavior

To make sure that our agent doesn't get stuck in excessively long loops, we can set max_iterations. We can also set an early stopping method, which will determine our agent's behavior once the number of max iterations is hit. By default, the early stopping uses method `force` which just returns that constant string. Alternatively, you could specify method `generate` which then does one FINAL pass through the LLM to generate an output.

```
mrkl = initialize_agent(
    tools,
    llm,
    agent=AgentType.OPENAI_FUNCTIONS,
    verbose=True,
    max_iterations=2,
    early_stopping_method="generate",
)
```

```
mrkl.run("What is the weather in NYC today, yesterday, and the day before?")
```

```
    [chain/start] [1:chain:AgentExecutor] Entering Chain run with input:
    {
      "input": "What is the weather in NYC today, yesterday, and the day before?"
    }
    [llm/start] [1:chain:AgentExecutor > 2:llm:ChatOpenAI] Entering LLM run with input:
    {
      "prompts": [
        "System: You are a helpful AI assistant.\nHuman: What is the weather in NYC today, yesterday, and the day before?"
      ]
    }
    [llm/end] [1:chain:AgentExecutor > 2:llm:ChatOpenAI] [1.27s] Exiting LLM run with output:
    {
      "generations": [
        [
          {
            "text": "",
            "generation_info": null,
            "message": {
              "lc": 1,
              "type": "constructor",
       "id": [
        "langchain",
        "schema",
        "messages",
        "AIMessage"
       ],
       "kwargs": {
        "content": "",
        "additional_kwargs": {
         "function_call": {
          "name": "Search",
          "arguments": "{\n  \"query\": \"weather in NYC
today\"\n}"
         }
        }
       }
      }
     }
    ]
   ],
   "llm_output": {
    "token_usage": {
     "prompt_tokens": 79,
     "completion_tokens": 17,
     "total_tokens": 96
    },
    "model_name": "gpt-3.5-turbo-0613"
   },
   "run": null
  }
  [tool/start] [1:chain:AgentExecutor > 3:tool:Search] Entering Tool run
with input:
  "{'query': 'weather in NYC today'}"
  [tool/end] [1:chain:AgentExecutor > 3:tool:Search] [3.84s] Exiting
Tool run with output:
  "10:00 am · Feels Like85° · WindSE 4 mph · Humidity78% · UV Index3 of
11 · Cloud Cover81% · Rain Amount0 in ..."
  [llm/start] [1:chain:AgentExecutor > 4:llm:ChatOpenAI] Entering LLM
run with input:
  {
   "prompts": [
    "System: You are a helpful AI assistant.\nHuman: What is the
weather in NYC today, yesterday, and the day before?\nAI: {'name':
'Search', 'arguments': '{\\n  \"query\": \"weather in NYC
```

```
today\"\\n}'}\nFunction: 10:00 am · Feels Like85° · WindSE 4 mph ·
Humidity78% · UV Index3 of 11 · Cloud Cover81% · Rain Amount0 in ..."
      ]
    }
    [llm/end] [1:chain:AgentExecutor > 4:llm:ChatOpenAI] [1.24s] Exiting
LLM run with output:
    {
      "generations": [
        [
          {
            "text": "",
            "generation_info": null,
            "message": {
              "lc": 1,
              "type": "constructor",
              "id": [
                "langchain",
                "schema",
                "messages",
                "AIMessage"
              ],
              "kwargs": {
                "content": "",
                "additional_kwargs": {
                  "function_call": {
                    "name": "Search",
                    "arguments": "{\n  \"query\": \"weather in NYC
yesterday\"\n}"
                  }
                }
              }
            }
          }
        ]
      ],
      "llm_output": {
        "token_usage": {
          "prompt_tokens": 142,
          "completion_tokens": 17,
          "total_tokens": 159
        },
        "model_name": "gpt-3.5-turbo-0613"
      },
      "run": null
    }
    [tool/start] [1:chain:AgentExecutor > 5:tool:Search] Entering Tool run
with input:
    "{'query': 'weather in NYC yesterday'}"
    [tool/end] [1:chain:AgentExecutor > 5:tool:Search] [1.15s] Exiting
Tool run with output:
    "New York Temperature Yesterday. Maximum temperature yesterday: 81 °F
(at 1:51 pm) Minimum temperature yesterday: 72 °F (at 7:17 pm) Average
temperature ..."
    [llm/start] [1:llm:ChatOpenAI] Entering LLM run with input:
    {
      "prompts": [
        "System: You are a helpful AI assistant.\nHuman: What is the
weather in NYC today, yesterday, and the day before?\nAI: {'name':
'Search', 'arguments': '{\\n  \"query\": \"weather in NYC
today\"\\n}'}\nFunction: 10:00 am · Feels Like85° · WindSE 4 mph ·
Humidity78% · UV Index3 of 11 · Cloud Cover81% · Rain Amount0 in ...\nAI:
{'name': 'Search', 'arguments': '{\\n  \"query\": \"weather in NYC
yesterday\"\\n}'}\nFunction: New York Temperature Yesterday. Maximum
temperature yesterday: 81 °F (at 1:51 pm) Minimum temperature yesterday:
72 °F (at 7:17 pm) Average temperature ..."
      ]
    }
    [llm/end] [1:llm:ChatOpenAI] [2.68s] Exiting LLM run with output:
    {
      "generations": [
        [
          {
            "text": "Today in NYC, the weather is currently 85°F with a
southeast wind of 4 mph. The humidity is at 78% and there is 81% cloud
cover. There is no rain expected today.\n\nYesterday in NYC, the maximum
temperature was 81°F at 1:51 pm, and the minimum temperature was 72°F at
7:17 pm.\n\nFor the day before yesterday, I do not have the specific
weather information.",
            "generation_info": null,
            "message": {
              "lc": 1,
              "type": "constructor",
              "id": [
                "langchain",
                "schema",
                "messages",
                "AIMessage"
              ],
       "kwargs": {
        "content": "Today in NYC, the weather is currently 85°F
with a southeast wind of 4 mph. The humidity is at 78% and there is 81%
cloud cover. There is no rain expected today.\n\nYesterday in NYC, the
maximum temperature was 81°F at 1:51 pm, and the minimum temperature was
72°F at 7:17 pm.\n\nFor the day before yesterday, I do not have the
specific weather information.",
        "additional_kwargs": {}
       }
      }
     }
    ]
   ],
   "llm_output": {
    "token_usage": {
     "prompt_tokens": 160,
     "completion_tokens": 91,
     "total_tokens": 251
    },
    "model_name": "gpt-3.5-turbo-0613"
   },
   "run": null
  }
  [chain/end] [1:chain:AgentExecutor] [10.18s] Exiting Chain run with
output:
  {
   "output": "Today in NYC, the weather is currently 85°F with a
southeast wind of 4 mph. The humidity is at 78% and there is 81% cloud
cover. There is no rain expected today.\n\nYesterday in NYC, the maximum
temperature was 81°F at 1:51 pm, and the minimum temperature was 72°F at
7:17 pm.\n\nFor the day before yesterday, I do not have the specific
weather information."
  }





  'Today in NYC, the weather is currently 85°F with a southeast wind of
4 mph. The humidity is at 78% and there is 81% cloud cover. There is no
rain expected today.\n\nYesterday in NYC, the maximum temperature was 81°F
at 1:51 pm, and the minimum temperature was 72°F at 7:17 pm.\n\nFor the
day before yesterday, I do not have the specific weather information.'
```

Notice that we never get around to looking up the weather the day before yesterday, due to hitting our max_iterations limit.