# Building AI Applications for Government Agencies

1. Copyright Elephant Scale

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## Course Description

* AI opens ways to building smart applications as never before.
* However, many use cases require implementing AI in a secure, responsible manner, including but not limited to:
  + Not sending your data to third-party online AI services
  + Keeping control over the data used for training
  + Controlling actions taken by AI
* In this course, the students learn how build the AI systems.
  + Prepare your data and store it in the semantic search databases (RAG)
  + Rules of sending questions to AI (Prompt Engineering)
  + Secure AI implementations using local models or networked local copy of the model
  + Best practices for cloud architecture

## After the course, you will be able to do the following tasks

* Talk to an AI in a correct way.
* Script talking to AI for a programmatic implementation.
* Organize your private documents for the implementation and break them into meaningful fragments for storing in the semantic search engine
* Structure the flow of conversation with AI about your private documents.
* Implement the system in production.
* Architect testing, and continuous improvements.

## Audience

* Developers, data scientists, team leads, project managers

## Skill Level

* Intermediate to advanced.

## Duration

* Three to five days

## Prerequisites

* General familiarity with machine learning
* Exposure to coding in any language
* Familiarity with Python helpful

## Format

* Lectures and hands on labs. (50% - 50%)

## Lab environment

* Zero Install: There is no need to install software on students’ machines!
* A lab environment in the cloud will be provided for students.

### Students will need the following

* A reasonably modern laptop with unrestricted connection to the Internet. Laptops with overly restrictive VPNs or firewalls may not work properly.
  + A checklist to verify connectivity will be provided
* Chrome browser

## Detailed outline

### Prompt Engineering

* Introduction to AI
* Iterative development
  + How to iteratively analyze and refine your prompts to generate marketing copy from a product fact sheet.
* Summarizing
  + How to make an AI summarize a document with different requirements and in different formats
* Inferring
  + How to make an AI infer sentiment and topics from product reviews and news articles.
* Transforming
  + How to use Large Language Models for text transformation tasks such as language translation, spelling and grammar checking, tone adjustment, and format conversion.
* Expanding
  + How to generate customer service emails that are tailored to each customer’s review.
* Chatbot
  + How to use an AI to have extended conversations with chatbots personalized or specialized for specific tasks or behaviors.
* Lab: Prompt-Engineering

### Semantic Search

* Organize your private documents for the implementation and break them into meaningful fragments for storing in the semantic search engine
* Semantic search
* Retrieval Augmented Generation (RAG)
* Recommender systems
* Hybrid search
* Facial similarity search
* Anomaly detection
* Lab: LLM with Semantic Search

### LangChain, glue to put it together

* Models, prompts, and parsers
* Memory
* Chains
* Q&A
* Evaluation
* Conversational bot
  + Lab: langchain
  + Lab: Functions-Tool-Agents-Langchain

### Architecture, testing, and continuous improvements

* Overview of Amazon, Azure, and Google clouds of RAG
* Evaluating and debugging Generative AI
* Practical examples and demos

## Practical Use Cases

### Intelligent Document Processing for Policy & Compliance

* Overview:
  + Government agencies deal with vast amounts of unstructured text—from policy documents to legislative texts. AI can be used to:
    - Automatically extract key information.
    - Summarize long documents.
    - Verify compliance with regulations.
* Lab
  + Develop a pipeline that uses NLP to extract and categorize key clauses from legislative documents, helping agencies quickly assess compliance and policy implications.

### Citizen Services Chatbots & Virtual Assistants

* Overview:
  + Enhance public service delivery by developing AI-driven chatbots that provide:
    - 24/7 citizen support.
    - Multilingual support.
    - Personalized guidance on government services.
* Lab
  + Build a prototype chatbot that integrates with a government service database, enabling citizens to inquire about service eligibility, status updates, or application processes.

### Predictive Analytics for Resource Allocation

* Overview:
  + Government agencies can leverage AI to forecast demand and optimize resource allocation across various services:
    - Budget planning.
    - Emergency response management.
    - Infrastructure maintenance.
* Lab
  + Create a predictive model using historical data to forecast the need for emergency services in a region, integrating geospatial data and demographic trends.

### Fraud Detection and Audit Automation

* Overview:
  + Detecting and preventing fraud is a major concern in government operations. AI can:
    - Identify anomalies in financial transactions.
    - Flag suspicious procurement activities.
    - Streamline internal audits.
* Lab
  + Develop an anomaly detection system on a sample dataset of transactions, showing how AI can flag potential fraud for human review.

### Social Media Monitoring & Public Sentiment Analysis

* Overview:
  + Governments can benefit from understanding public sentiment around policies or services:
    - Track reactions to new initiatives.
    - Monitor misinformation.
    - Gauge public opinion in near-real time.
* Lab
* Use NLP to analyze tweets or public comments about a policy change, then visualize sentiment trends over time.

### Ethical AI and Accountability in Public Sector Applications

* Overview:
  + With increasing AI use in government, ethical considerations become paramount:
    - Ensure transparency and fairness.
    - Mitigate bias.
    - Establish accountability frameworks.
* Lab
  + Engage students in a workshop to audit an AI system for fairness and transparency, followed by discussions on policy implications and governance mechanisms.