INTEGRATED ROBUST SOLUTIONS, ISLAMABAD

Week 4 Task: AI Internship

Real-World Machine Learning Systems

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Prepared for IR Solutions AI Interns

Contents

1 Introduction

This document outlines the Week 4 tasks for AI interns at IR Solutions. The focus of this week is on understanding critical considerations for building and deploying machine learning (ML) models in real-world settings. Interns will study selected modules from Google's Machine Learning Crash Course, covering production ML systems, automated machine learning (AutoML), and ML fairness. To foster creativity and personalized learning, there are no mandatory practical tasks; instead, interns are given the flexibility to explore any topic related to AI, ML, Python, or related technologies. Weekly deliverables include a PDF report, submitted by **Friday, August 1, 2025, 5:30 PM PKT**.

2 Objectives

The Week 4 tasks aim to:

- Develop a comprehensive understanding of real-world ML systems, including productionization, automation, and fairness considerations.
- Explore automated machine learning (AutoML) techniques to streamline model development.
- Learn strategies for auditing ML models for fairness and mitigating biases in data and predictions.
- Encourage independent exploration of AI/ML topics through self-directed projects or theoretical study.
- Practice professional documentation through a structured PDF report summarizing learning and exploration.

3 Theoretical Learning

Interns are required to complete the following modules from Google's Machine Learning Crash Course (`https://developers.google.com/machine-learning/crash-course`) to gain insights into real-world ML systems:

3.1 Production ML Systems

- **Course Material**: Production ML Systems
- **Learning Objectives**:
  - Understand the components of a production ML system, including data collection, feature extraction, process management, and monitoring.
  - Learn how ML model code integrates with broader system infrastructure and the importance of robust system design.

3.2 AutoML

- **Course Material**: AutoML
- **Learning Objectives**:
  - Explore the principles and best practices of automated machine learning (AutoML).

  - Understand how AutoML automates tasks like feature engineering, algorithm selection, and hyperparameter tuning to improve efficiency.

3.3 ML Fairness

- **Course Material**: ML Fairness
- **Learning Objectives**:
  - Learn strategies for auditing ML models for fairness and identifying biases in training data and predictions.
  - Explore techniques to mitigate biases and ensure responsible ML model deployment.

4 Self-Directed Exploration

For Week 4, there are no mandatory practical tasks. Instead, interns are encouraged to leverage this opportunity to explore any area of interest within artificial intelligence, machine learning, Python, or related technologies. This flexibility allows interns to pursue topics that align with their career goals or curiosity. Possible exploration areas include:

- **Practical Coding**: Develop a project using Python, such as building a machine learning model, experimenting with deep learning frameworks (e.g., TensorFlow, PyTorch), or creating a data visualization dashboard.
- **Model Experimentation**: Revisit and improve models from previous weeks (e.g., breast cancer prediction or Fashion MNIST classification) or explore new datasets and algorithms from platforms like Kaggle or UCI Machine Learning Repository.
- **Theoretical Study**: Dive deeper into AI/ML concepts, such as reinforcement learning, generative AI, computer vision, or natural language processing, through research papers, online courses, or tutorials.
- **Tool Exploration**: Experiment with AI/ML tools and platforms, such as Jupyter notebooks etc.
- **Other AI-Related Topics**: Explore emerging areas like explainable AI, federated learning, or AI ethics, or work on Python-based projects like web scraping, automation scripts, or API development for AI applications.

Interns should document their exploration in the PDF report, including the motivation, methodology, outcomes, and any code, visualizations, or insights produced.

5 Submission Guidelines

5.1 PDF Report

- **Format**:
  - **Title Page**: Include IR Solutions logo, intern's name, designation (AI Intern), department (Artificial Intelligence), and date.
  - **Sections**:

    - **Theoretical Understanding**: Summarize key concepts from the assigned course modules (Production ML Systems, AutoML, ML Fairness).
    - **Self-Directed Exploration**: Describe the chosen exploration topic, including motivation, methodology, and outcomes (e.g., code, experiments, or theoretical insights).
    - **Challenges and Approaches**: List challenges faced during exploration and solutions applied.
    - **Results and Analysis**: Present outcomes of the exploration, including any visualizations, metrics, or findings.
    - **Spare Time Activities**: Note any additional learning or activities undertaken during the week.
    - **Conclusion**: Summarize key takeaways and plans for further improvement.
    - **References**: Cite all resources used, including course materials and additional sources.
  - Use professional formatting with headings, subheadings, bullet points, and tables/plots for results (if applicable).

- **File Naming**: `Week4_InternName_Report.pdf`

5.2 Optional Code Submission

- If the self-directed exploration involves coding (e.g., a Google Colab notebook), submit the code as `Week4_InternName_Exploration.ipynb`.
- Follow PEP 8 standards, include clear comments, and use Markdown cells for methodology, analysis, and visualizations (if applicable).
- Ensure the notebook is fully executable with no errors.

5.3 Submission Process

- Upload the PDF report (and optional .ipynb file) to the designated Google Drive folder by **Friday, August 1, 2025, 5:30 PM PKT**.
- Ensure files are clearly named and organized in the Week 4 folder.

6 Evaluation Criteria

Interns will be evaluated based on:

- **Theoretical Understanding (40%)**: Depth and clarity of concepts learned from the course modules.
- **Self-Directed Exploration (30%)**: Creativity, relevance, and quality of the chosen exploration topic and its documentation.
- **Report Quality (20%)**: Clarity, completeness, and adherence to the defined format.
- **Best Practices (10%)**: For code submissions, adherence to PEP 8, modular code, and clear documentation.

7 Additional Notes

- **Resources**: Refer to the Google Machine Learning Crash Course and additional resources like research papers, online tutorials, or AI/ML platforms for self-directed exploration.
- **Support**: Reach out to AI team members or Lead AI via Slack or during the standup meeting (Friday, 3:00 PM PKT) for guidance.
- **Expectations**: Maintain-professionalism, meet deadlines, and actively engage in learning and exploration.

8 References

- Google Machine Learning Crash Course: `https://developers.google.com/machine-learni crash-course`
- GeeksforGeeks:
  - `https://www.geeksforgeeks.org/machine-learning`
  - `https://www.geeksforgeeks.org/automated-machine-learning-automl`
  - `https://www.geeksforgeeks.org/fairness-in-machine-learning`
- YouTube Tutorials:
  - `https://www.youtube.com/watch?v=_3y7C7_do-k`
  - `https://www.youtube.com/watch?v=7Bg3iBq-SIY`
  - `https://www.youtube.com/watch?v=0YdpwSYMY6I`