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| **Name of Student: Pushkar Sane** | | |
| **Roll Number: 45** | **Lab Assignment Number: 3, 4** | |
| **Title of Lab Assignment: Introduction to AWS SageMaker, Data Labeling in AWS Sage maker Ground Truth, Labeling Text, Bounding Boxes and Semantic Segmentation in Ground Truth.** | | |
| **DOP: 14-02-2024** | **DOS: 22-02-2024** | |
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## Practical No. 3 & 4

**Aim: Introduction to AWS SageMaker, Data Labeling in AWS Sage maker Ground Truth, Labeling Text, Bounding Boxes and Semantic Segmentation in Ground Truth.**

**Theory:**

Amazon SageMaker is a fully managed service by AWS that simplifies the machine learning workflow, from data preparation to model deployment. It provides a range of tools and services for building, training, and deploying machine learning models at scale. With SageMaker, developers and data scientists can efficiently experiment with different algorithms, automate model training with Autopilot, and deploy models with ease using managed endpoints. SageMaker also offers capabilities for data labeling, model monitoring, and governance, making it a comprehensive platform for AI development.

**Components of AWS Sagemaker:**

1. **Jump Start:**
    - Amazon SageMaker JumpStart provides access to popular machine learning algorithms and model templates.
    - Amazon SageMaker JumpStart provides access to pre-built machine learning models and solutions, accelerating the model development process.
    - It offers a curated selection of algorithms and model templates, allowing users to quickly get started with common machine learning tasks without the need for extensive setup or configuration.

      **To use JumpStart:**
    - Log in to the AWS Management Console.
    - Navigate to Amazon SageMaker.
    - Choose "JumpStart" from the left-hand menu.
    - Select the algorithm or model template that fits your needs.
    - Follow the provided instructions to configure and deploy the chosen model.

2. **Ground Truth:**
    - Amazon SageMaker Ground Truth helps label data for machine learning models efficiently.

- Amazon SageMaker Ground Truth is a data labeling service that makes it easy to annotate datasets for training machine learning models.
- Ground Truth offers both human annotation and automated data labeling capabilities, helping users generate high-quality labeled datasets efficiently.

**Steps to use Ground Truth:**

- Log in to the AWS Management Console.
- Navigate to Amazon SageMaker.
- Choose "Ground Truth" from the left-hand menu.
- Create a labeling job by specifying the input data, labeling categories, and workforce.
- Launch the labeling job and monitor its progress.
- Once labeling is complete, use the labeled data for training your model.

3. **Governance:**
   - SageMaker provides governance features to manage access, security, and compliance of machine learning workflows.
   - SageMaker Governance features enable users to manage access, security, and compliance for machine learning workflows.
   - It provides tools for defining IAM policies, auditing model activities, implementing encryption, and enforcing data privacy and compliance requirements.

   **Steps for governance:**

   - Navigate to SageMaker in the AWS Management Console.
   - Set up IAM roles and policies to control access to SageMaker resources.
   - Use AWS CloudTrail to monitor API activity.
   - Implement encryption for data at rest and in transit.
   - Configure VPC settings for SageMaker resources to control network access.

4. **Notebook:**
   - Amazon SageMaker Notebooks provide a fully managed Jupyter notebook instance for building and testing models.
   - SageMaker Notebook Instances provide a fully managed Jupyter notebook environment for building, experimenting, and collaborating on machine learning projects.

- Users can leverage built-in libraries and frameworks, scale compute resources as needed, and integrate with other SageMaker components seamlessly.

**To use SageMaker Notebooks:**

- Navigate to SageMaker in the AWS Management Console.
- Choose "Notebook instances" from the left-hand menu.
- Create a new notebook instance, selecting the instance type and IAM role.
- Open the Jupyter notebook interface and start writing code.
- Save your work to Amazon S3 or GitHub for version control.

5. **Processing:**
   - SageMaker Processing allows you to preprocess data and run custom data transformations at scale.
   - SageMaker Processing allows users to preprocess and analyze data at scale before training machine learning models.
   - It supports custom data transformations, parallel execution of processing tasks, and integration with other AWS services for data storage and retrieval.

   **Steps for processing:**

   - Navigate to SageMaker in the AWS Management Console.
   - Choose "Processing jobs" from the left-hand menu.
   - Create a processing job, specifying the input data, processing script, and output location.
   - Monitor the status of the processing job and view logs for debugging if needed.

6. **Training:**
   - SageMaker Training enables you to train machine learning models using built-in algorithms or custom scripts.
   - SageMaker Training enables users to train machine learning models using built-in algorithms, custom code, or frameworks like TensorFlow and PyTorch.
   - It offers distributed training capabilities, automatic model tuning, and support for training on large datasets stored in Amazon S3.

   **Steps for training:**

   - Navigate to SageMaker in the AWS Management Console.
   - Choose "Training jobs" from the left-hand menu.

- Create a training job, specifying the algorithm or script, input data location, and output location.
- Configure hyperparameters and instance types for training.
- Monitor the training job's progress and view logs for insights.

7. **Inference:**
   - Amazon SageMaker Inference allows you to deploy trained models for real-time or batch inference.
   - SageMaker Inference enables users to deploy trained models for real-time or batch inference, serving predictions at scale with low latency.
   - It provides managed endpoints, automatic scaling, and integration with AWS Lambda and API Gateway for building scalable inference pipelines.

   **To deploy a model for inference:**
   - Navigate to SageMaker in the AWS Management Console.
   - Choose "Endpoints" from the left-hand menu.
   - Create a new endpoint, specifying the trained model, instance type, and number of instances.
   - Once the endpoint is created, you can use it to make predictions by sending HTTP requests.

8. **Augmented AI:**
   - SageMaker Augmented AI (A2I) helps you build human review workflows for ML predictions to improve model accuracy.
   - SageMaker Augmented AI (A2I) helps improve the accuracy of machine learning models by integrating human review into the prediction process.
   - It allows users to create custom review workflows, route predictions to human reviewers, and incorporate feedback to continuously improve model performance

   **Steps for AI:**
   - Navigate to SageMaker in the AWS Management Console.
   - Choose "Ground Truth" from the left-hand menu.
   - Create a human review workflow by specifying the conditions for sending predictions to human reviewers.
   - Configure the workforce and define the instructions for reviewers.

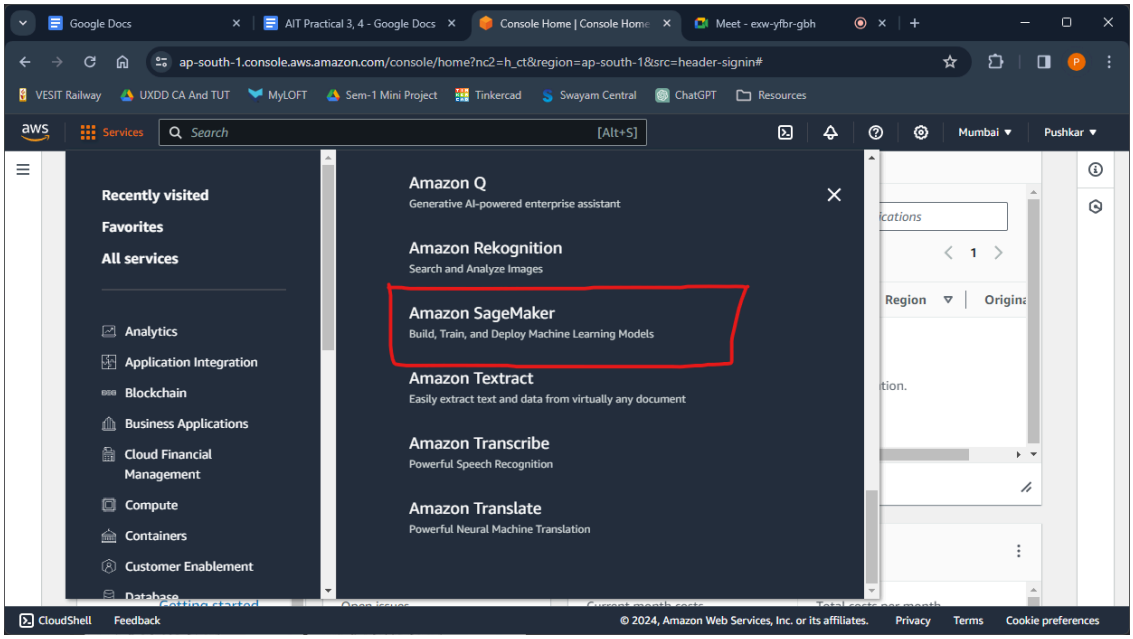
- Monitor the human review process and incorporate feedback to improve model performance.

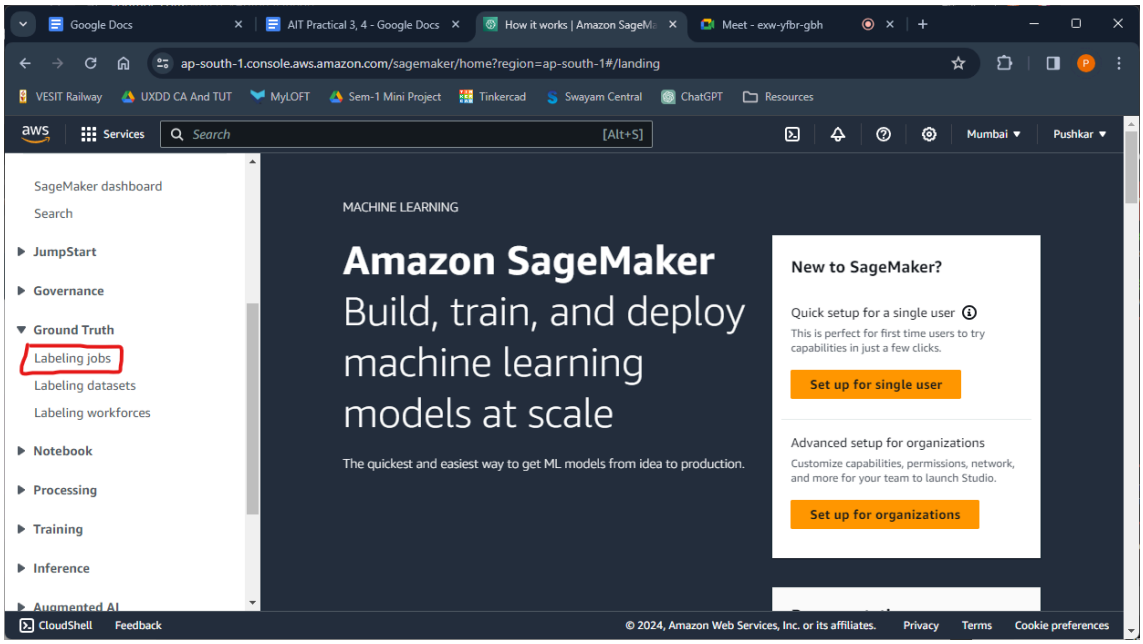
9. **AWS Marketplace (GluonCV YOLO v3 object detector):**
    - The AWS Marketplace offers pre-built machine learning models and algorithms for easy integration into SageMaker.
    - The AWS Marketplace offers a wide range of pre-built machine learning models and algorithms, including the GluonCV YOLO v3 object detector.
    - Users can easily deploy these models in SageMaker for tasks like object detection, image classification, and natural language processing, accelerating the development of AI applications.

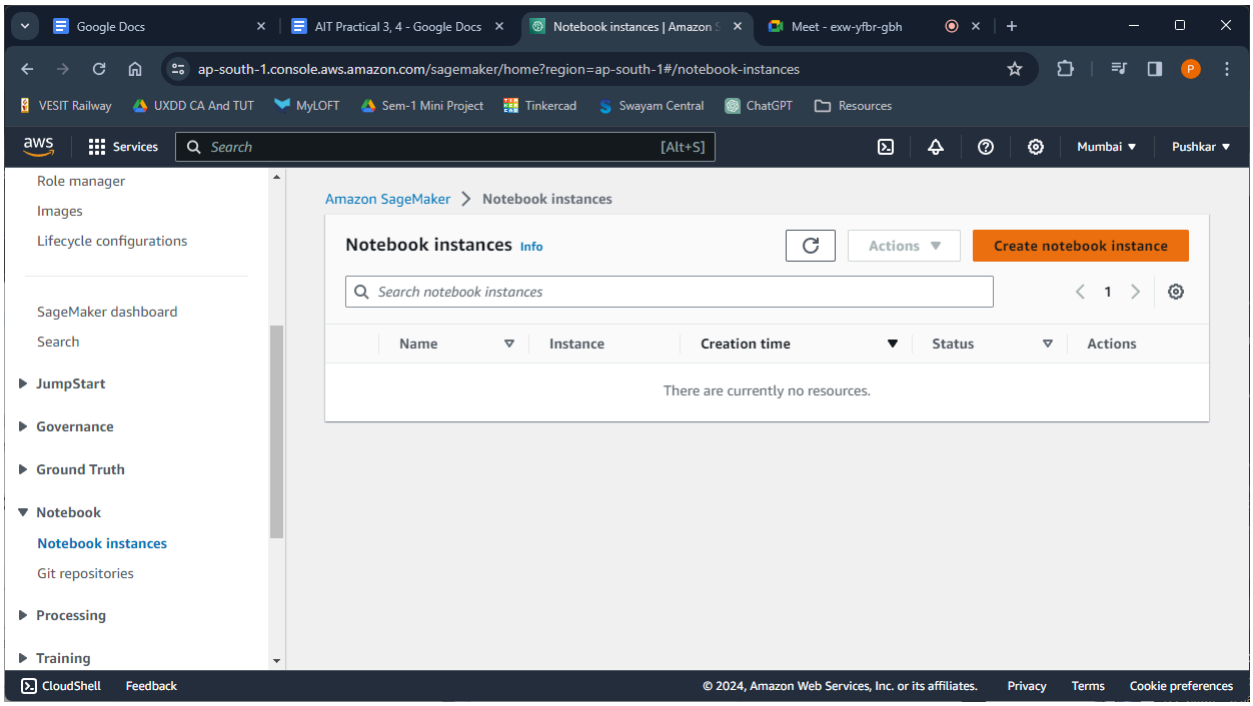
      **To use GluonCV YOLO v3 object detector:**
    - Navigate to the AWS Marketplace in the AWS Management Console.
    - Search for "GluonCV YOLO v3 object detector" and subscribe to the listing.
    - Follow the provided instructions to deploy the model in SageMaker.
    - Once deployed, you can use the model for object detection tasks by sending input images to the endpoint.

Remember to manage costs effectively by monitoring resource usage and shutting down instances when not in use. Additionally, ensure compliance with data privacy regulations when handling sensitive data.

## Steps to explore the AWS sagemaker:

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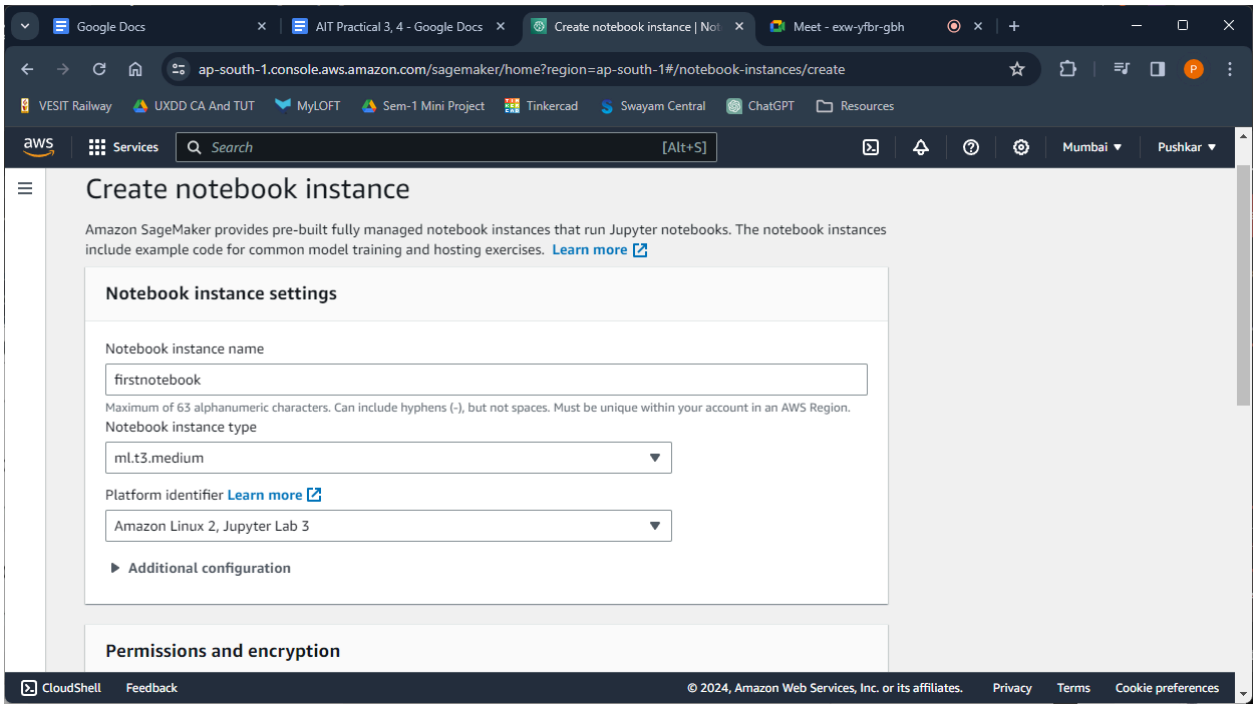
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Create notebook instance
Amazon SageMaker provides pre-built fully managed notebook instances that run Jupyter notebooks. The notebook instances include example code for common model training and hosting exercises. Learn more
Notebook instance settings
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firstnotebook
Maximum of 63 alphanumeric characters. Can include hyphens (-), but not spaces. Must be unique within your account in an AWS Region.
Notebook instance type
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Platform identifier Learn more
Amazon Linux 2, Jupyter Lab 3
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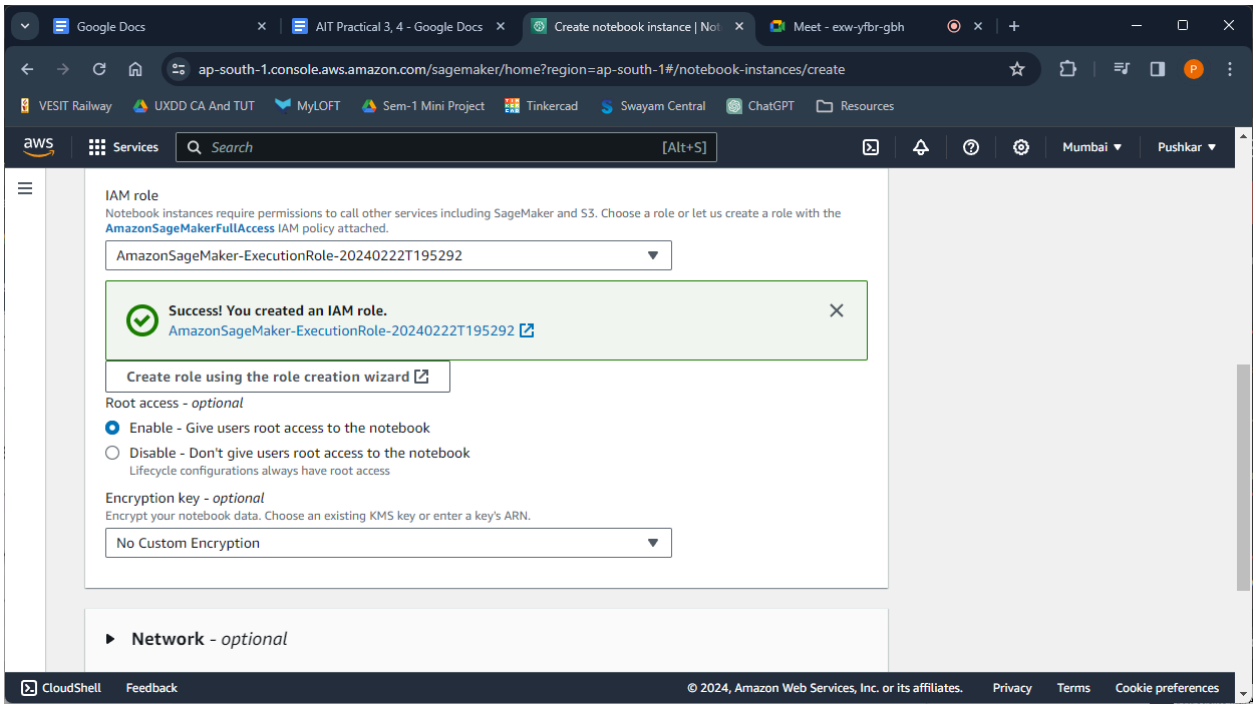
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IAM role
Notebook instances require permissions to call other services including SageMaker and S3. Choose a role or let us create a role with the AmazonSageMakerFullAccess IAM policy attached.
AmazonSageMaker-ExecutionRole-20240222T195292
Success! You created an IAM role.
AmazonSageMaker-ExecutionRole-20240222T195292
Create role using the role creation wizard
Root access - optional
Enable - Give users root access to the notebook
Disable - Don't give users root access to the notebook
Lifecycle configurations always have root access
Encryption key - optional
Encrypt your notebook data. Choose an existing KMS key or enter a key's ARN.
No Custom Encryption
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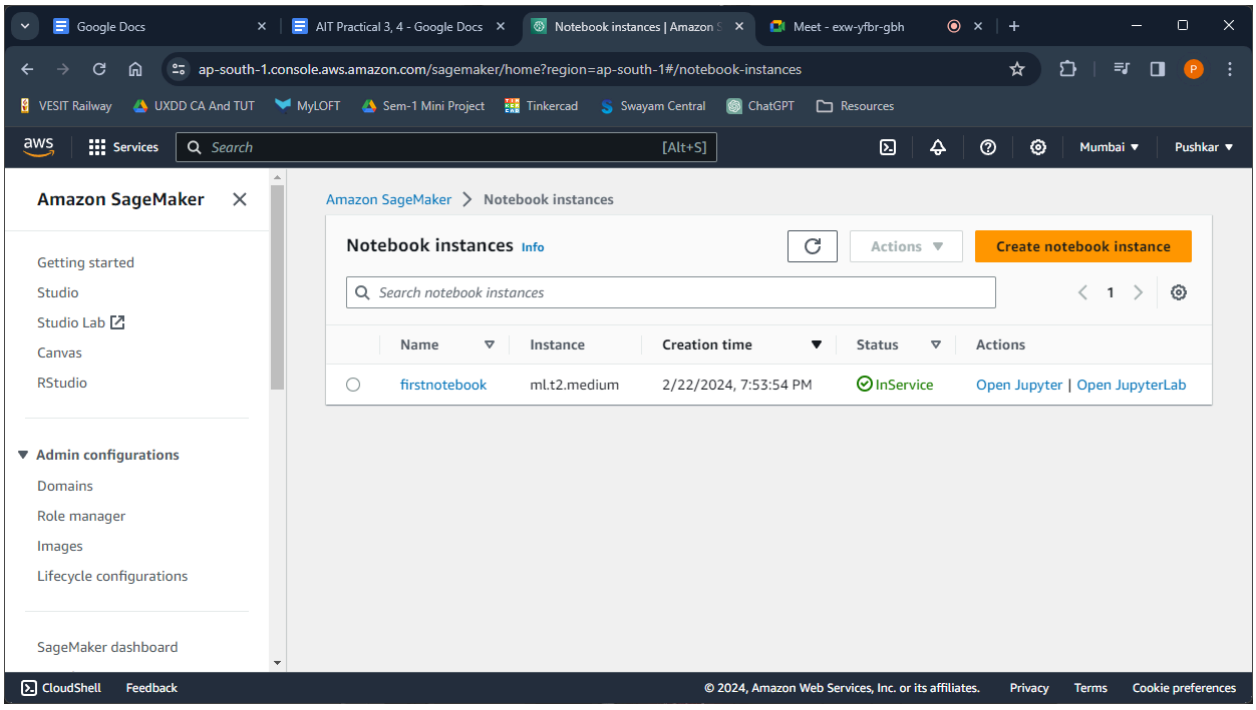
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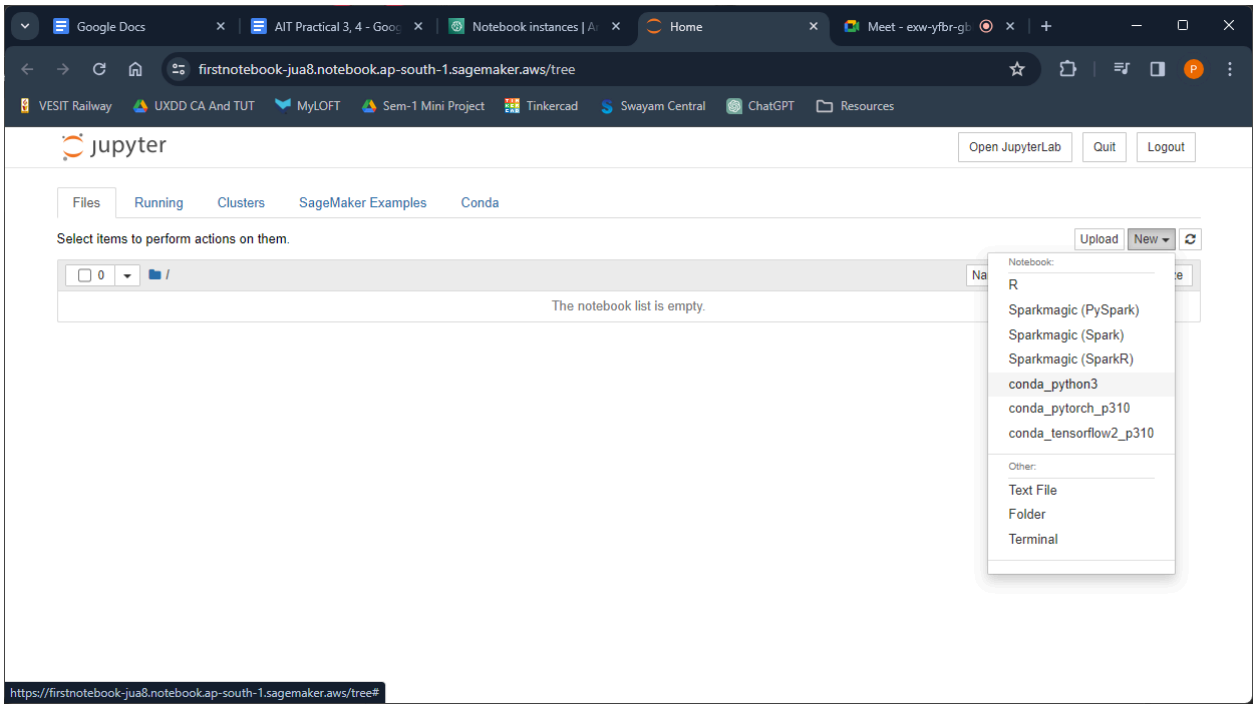
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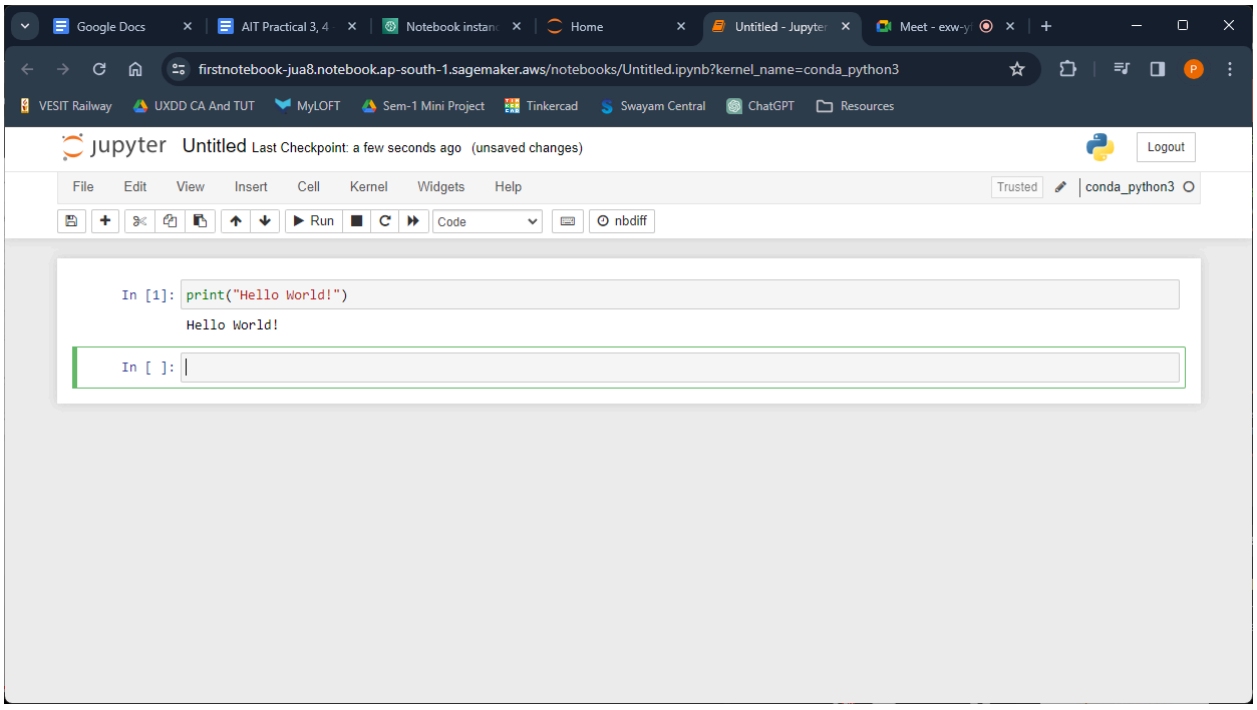
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print("Hello World!")
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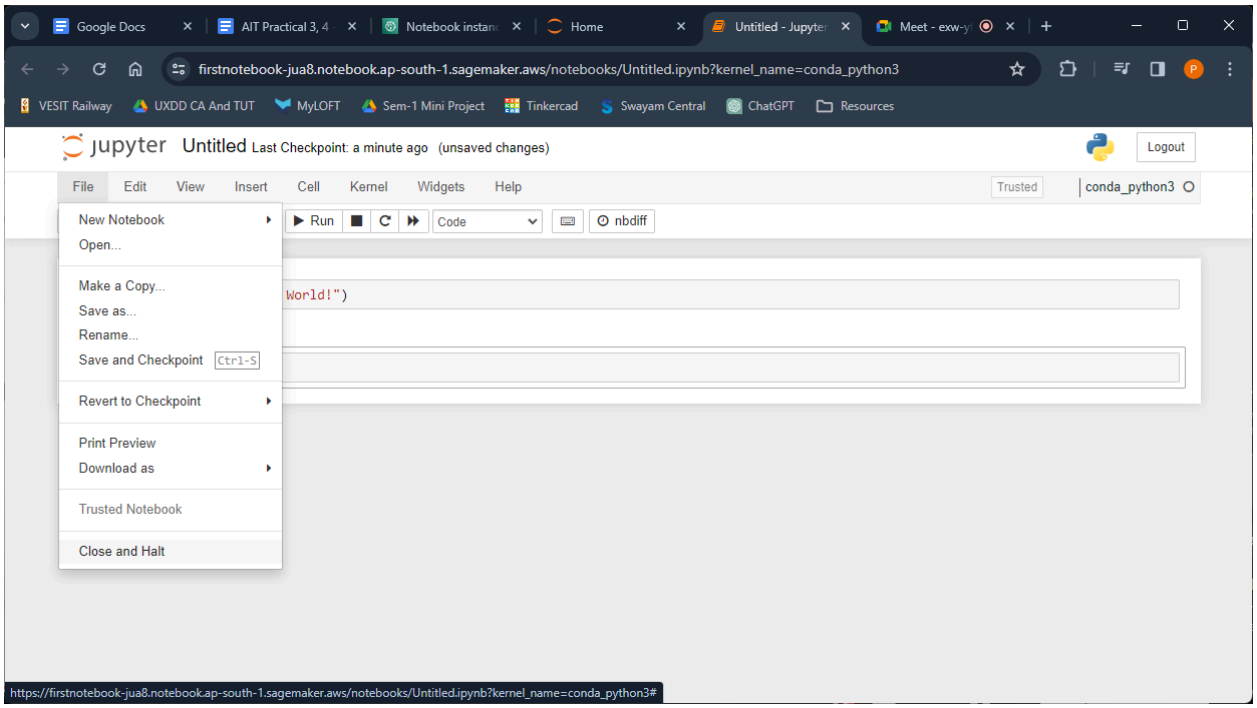
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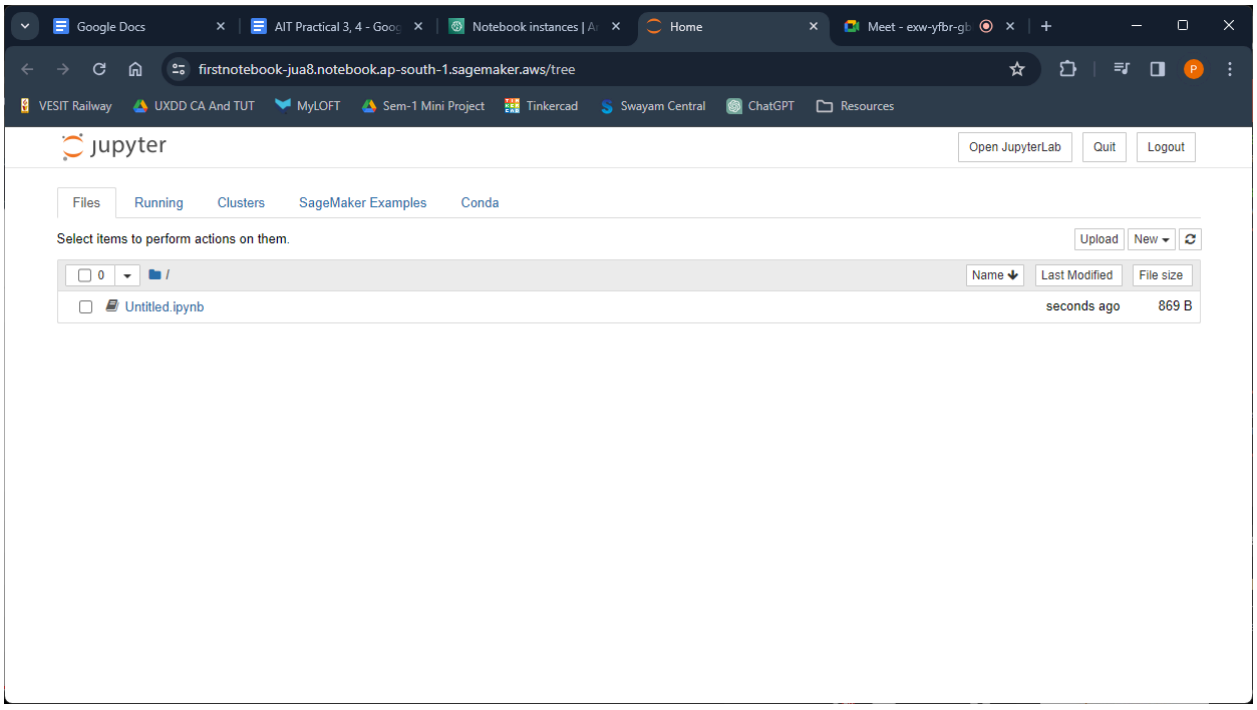
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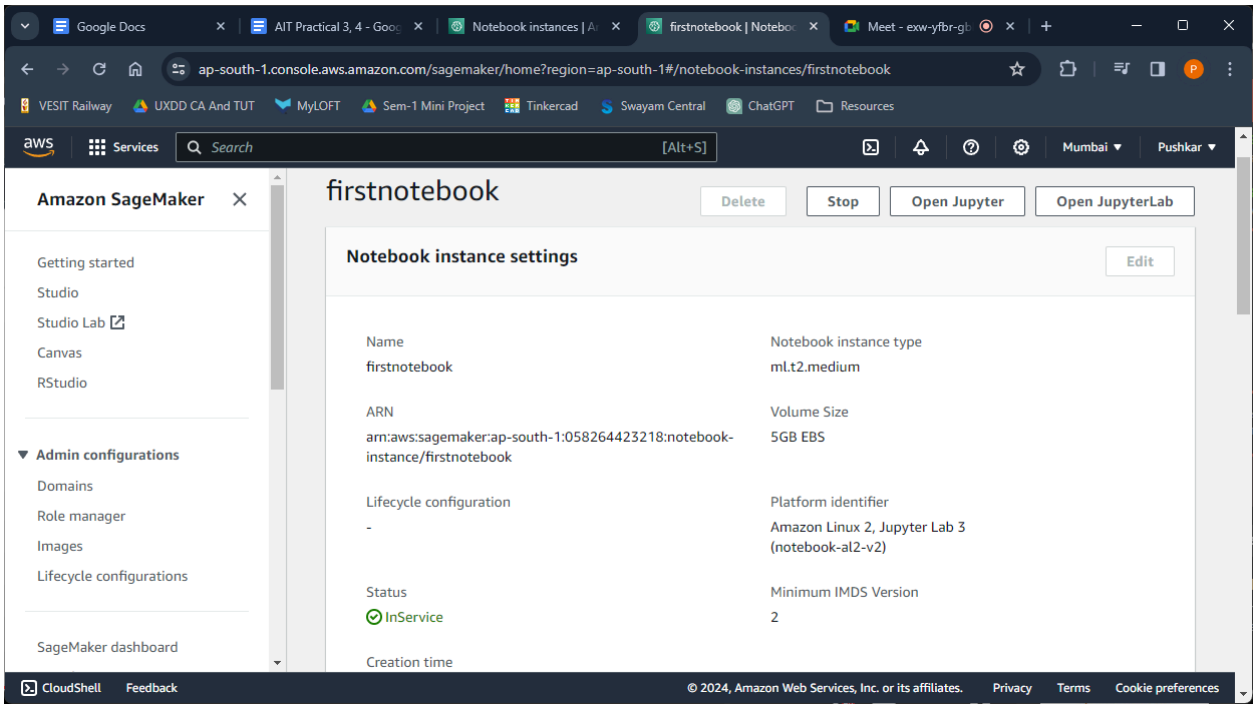
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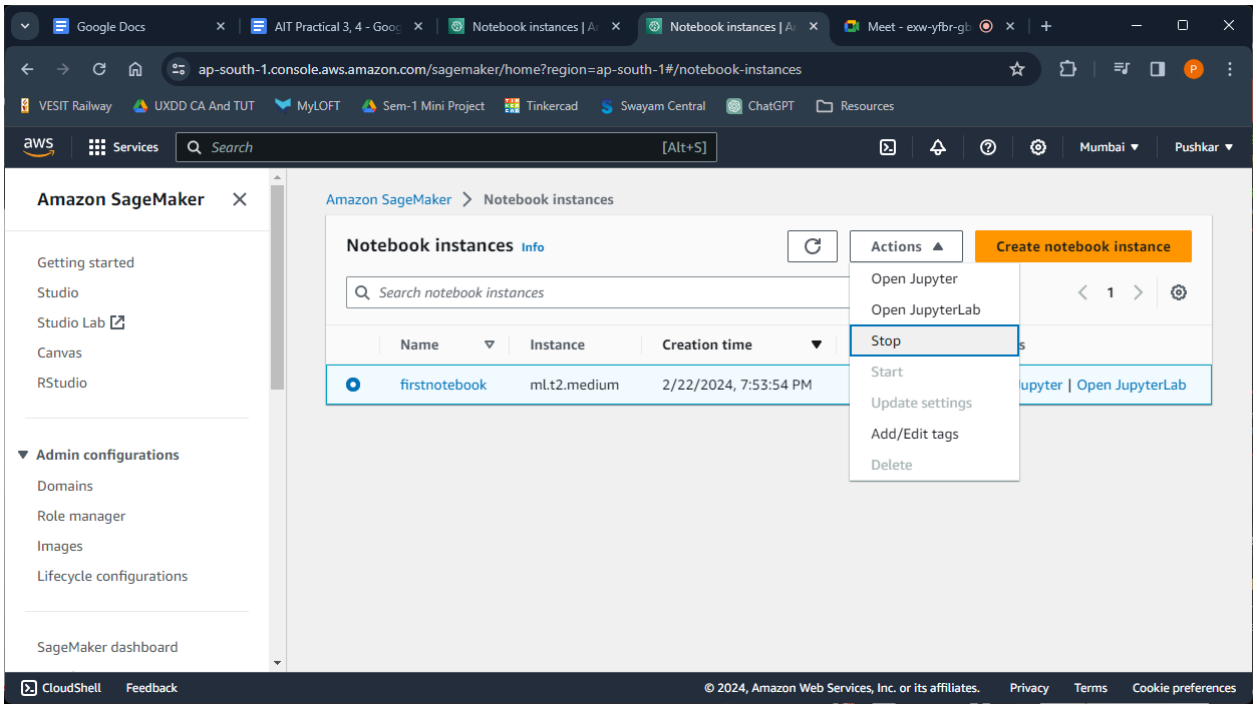
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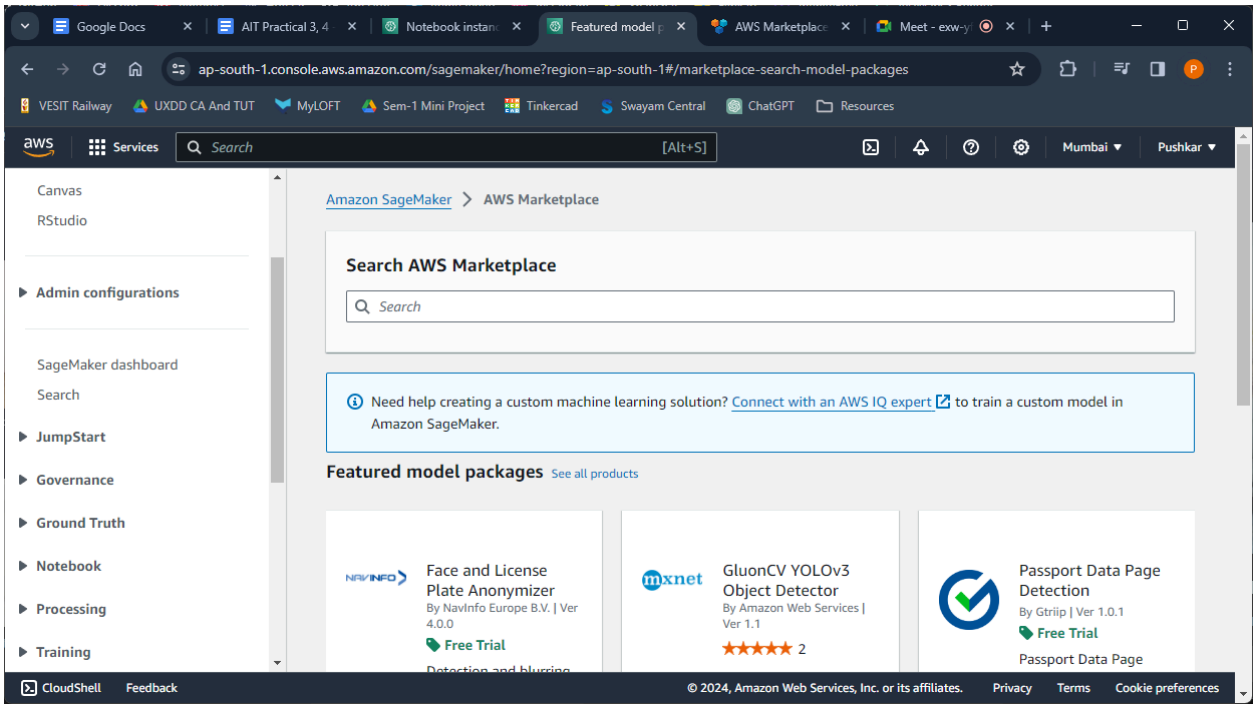
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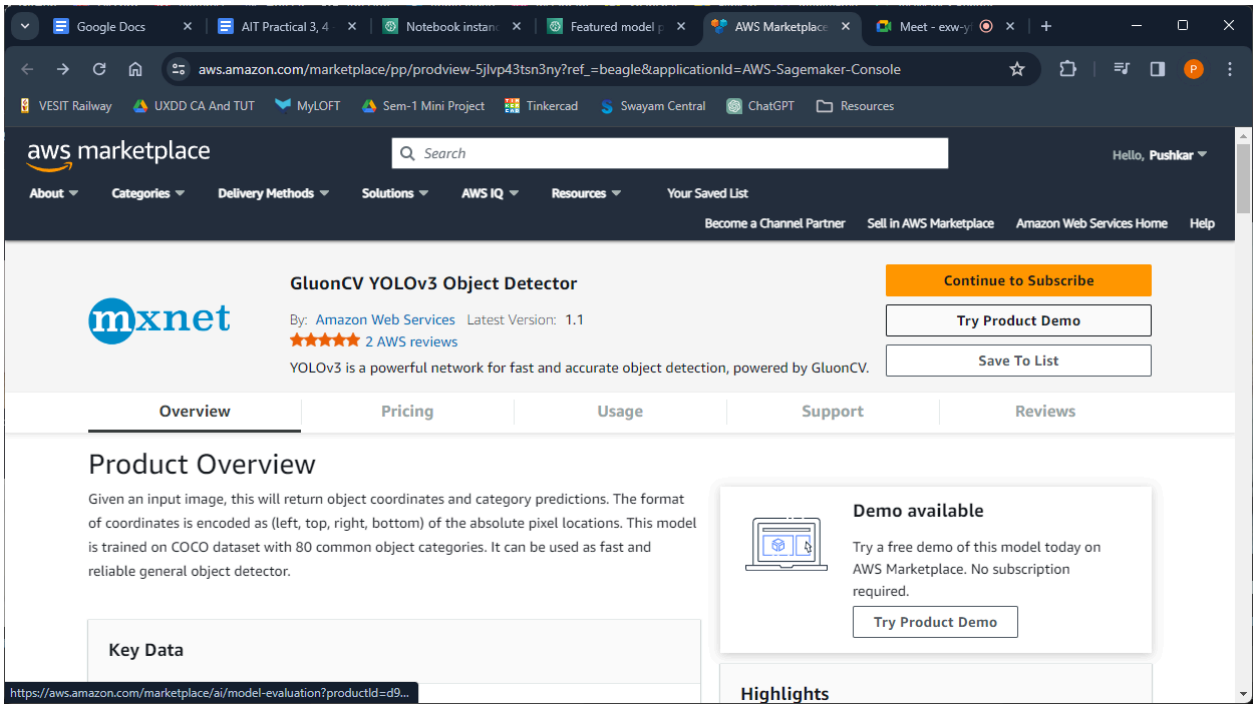
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Sell in AWS Marketplace
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GluonCV YOLOv3 Object Detector
By: Amazon Web Services Latest Version: 1.1
2 AWS reviews
YOLOv3 is a powerful network for fast and accurate object detection, powered by GluonCV.
Continue to Subscribe
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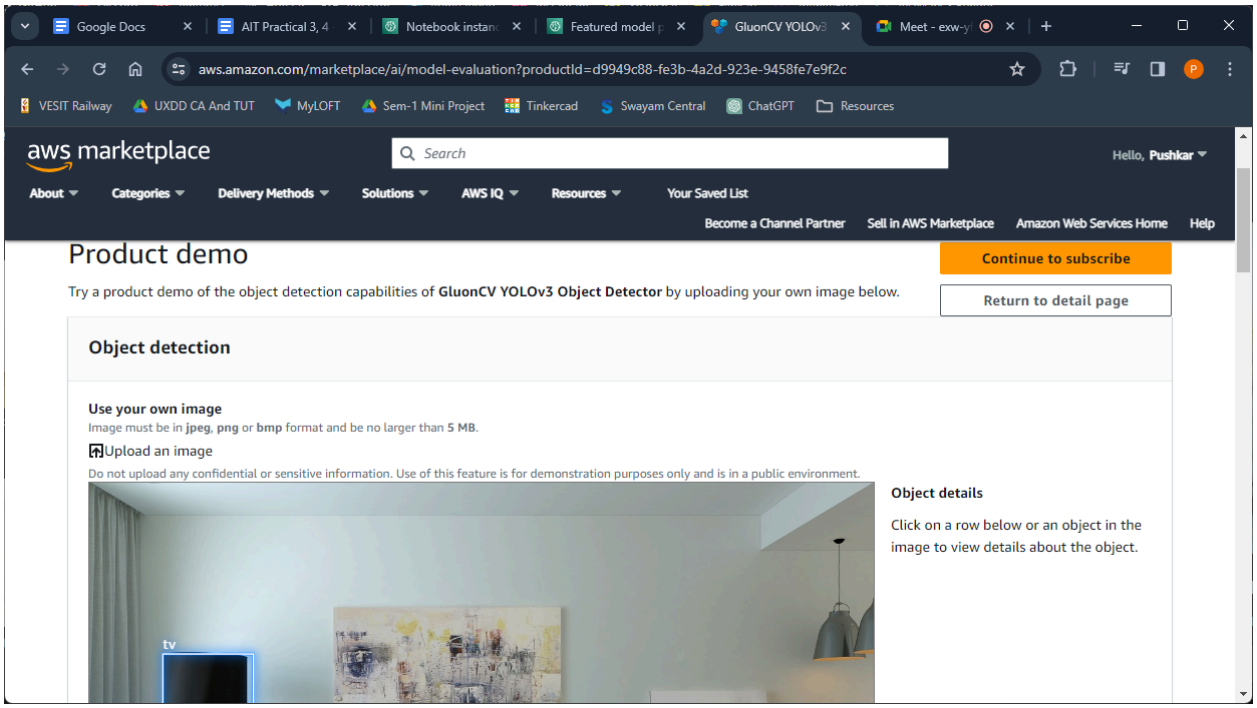
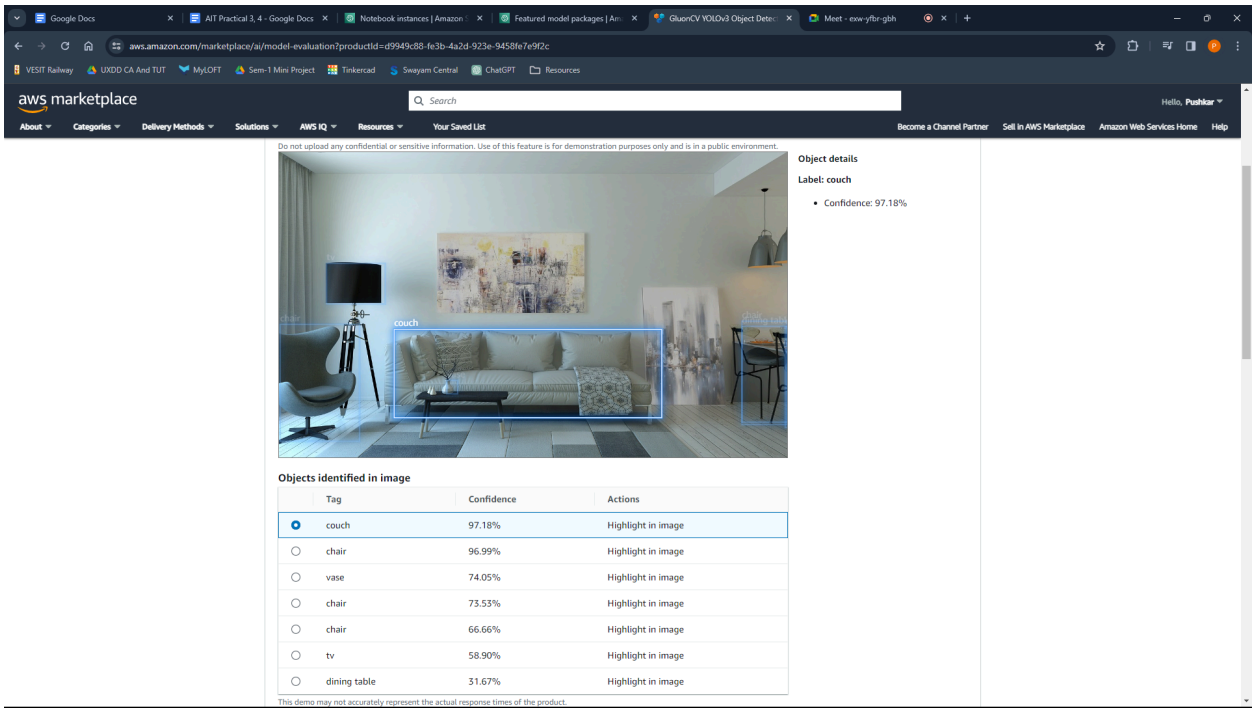
Product Overview
Given an input image, this will return object coordinates and category predictions. The format of coordinates is encoded as (left, top, right, bottom) of the absolute pixel locations. This model is trained on COCO dataset with 80 common object categories. It can be used as fast and reliable general object detector.
Demo available
Try a free demo of this model today on AWS Marketplace. No subscription required.
Try Product Demo
Key Data
Highlights
https://aws.amazon.com/marketplace/ai/model-evaluation?productId=d9...




**Conclusion: Successfully explored all the components of the AWS Sagemaker.**