CCs

numberfy

➜ whoami

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Agenda

➜ ls agenda/

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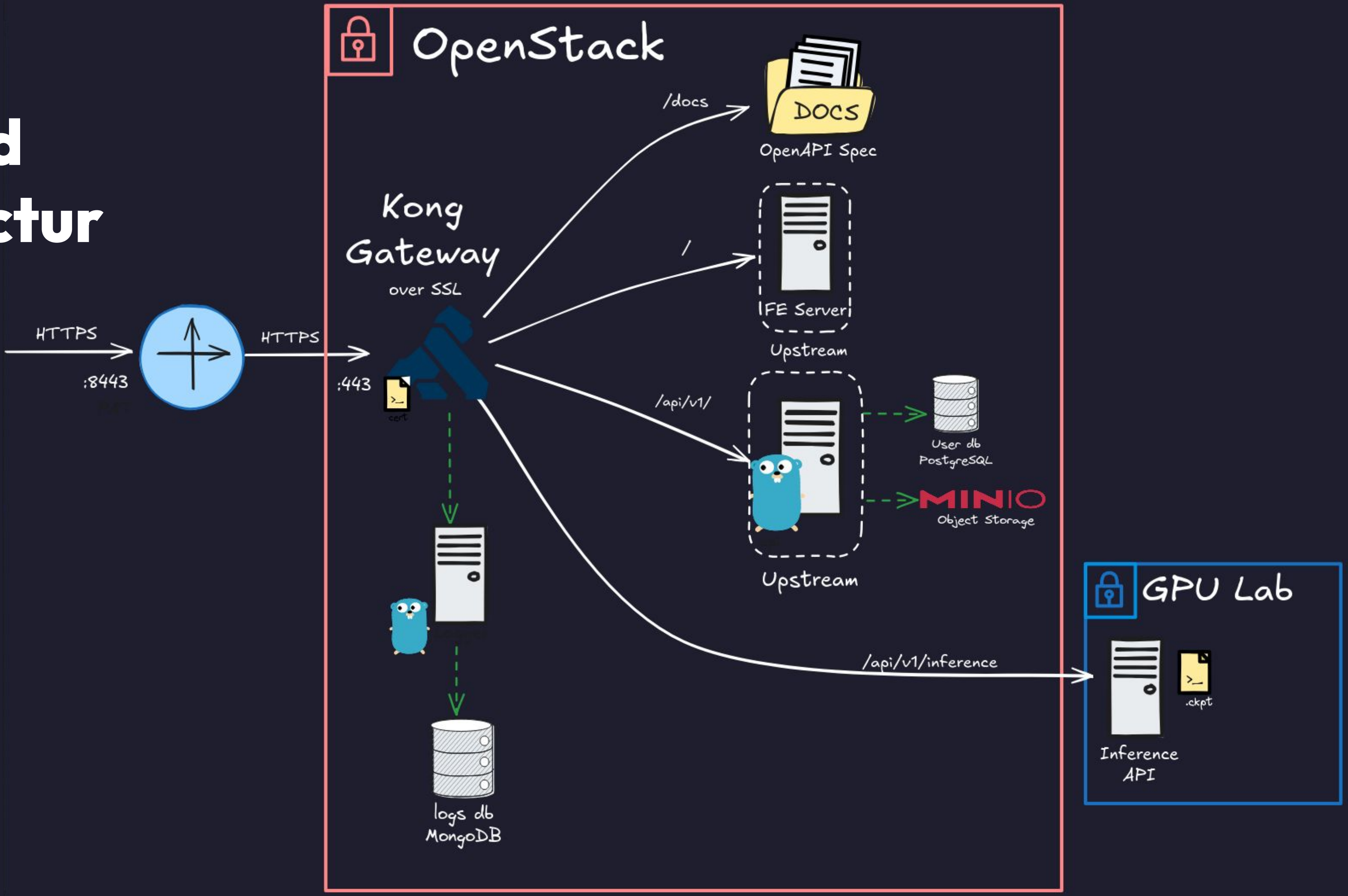
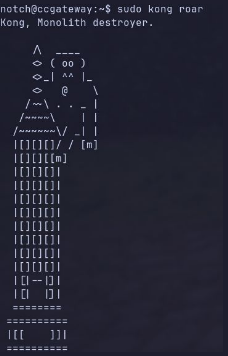
Introduction

- Web application that allows drawing digits (0-9) on a 112x112 canvas and getting them recognized.
- Automatic recognition system using AI.
- Inference history per user.
- Authentication flows with OAuth2 standard implementation.

Cloud Architecture





```
notch@ccgateway:~$ sudo kong roar
Kong, Monolith destroyer.

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```

Load Balancing and Scalability

- Centralized API Gateway
- 2 load-balanced Frontend instances
- 2 load-balanced Backend instances
- Centralized logging on dedicated VM
- PAT Overload for external access from Tec network

Authentication

- Framework: Gin + GORM with PostgreSQL
- OAuth2 Flows: Authorization Code, Client Credentials, Password Grant, Refresh Token
- Key Endpoints:
  - /oauth2/authorize → Authorization code generation
  - /oauth2/token → Token exchange (access + refresh)
  - /oauth2/introspect → Token validation
- Authentication Middleware: Bearer token validation for protected routes.
- Administration: Complete management of clients, consumers and tokens.

Databases

Robust PostgreSQL Schema

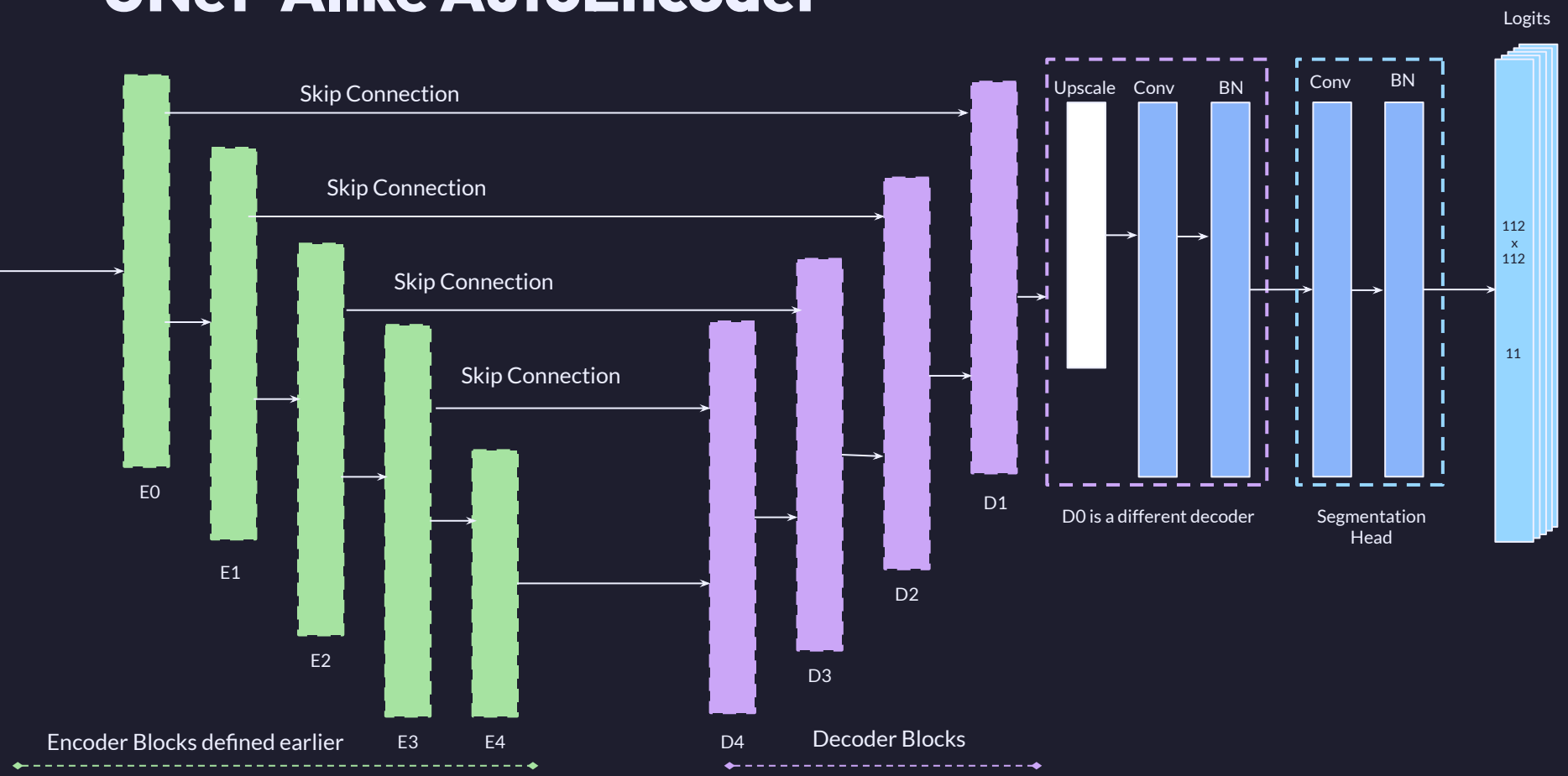
- Users: Authentication with bcrypt, UUIDs as PKs
- Images: Tracking of pairs (sent_image_id, received_image_id)
- OAuth2: Credentials, Tokens, Authorization Codes, Refresh Tokens

Object Storage using MinIO (buckets)

- Image IDs are stored in PostgreSQL

NoSQL MongoDB instance for Logs

UNet-Alike AutoEncoder



Check the Notebooks

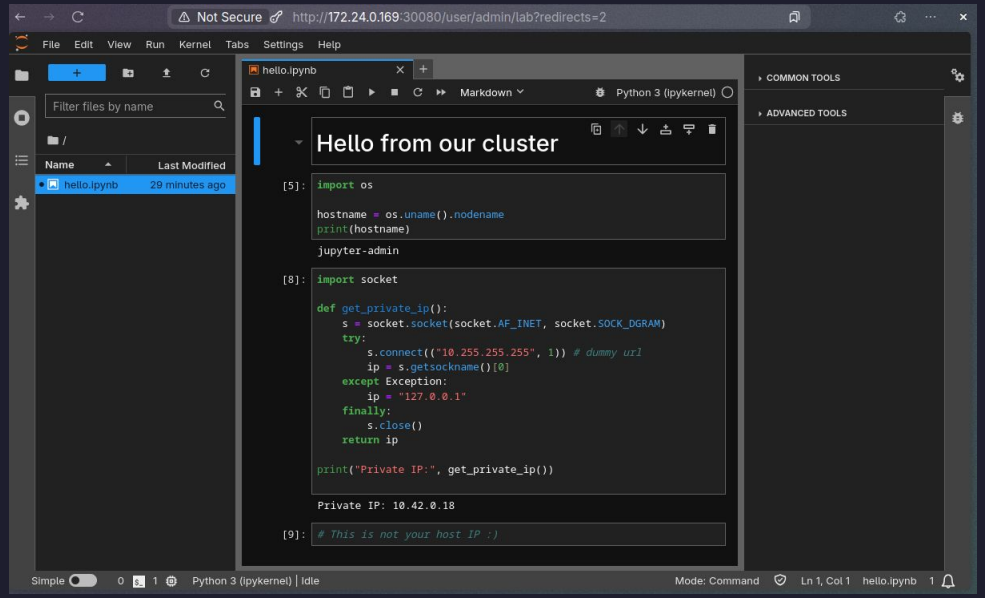
https://drive.google.com/drive/folders/1vhfsJTQdxcH4m2n7vYLj330JxrSGqNQg?usp=sharing

DEMO

Click me ↑

➜ curl https://10.49.12.47:8443/

Future Work



➜ echo “MLOps”

➜ echo “Authorization codes”
&&
echo “Further Scopes”

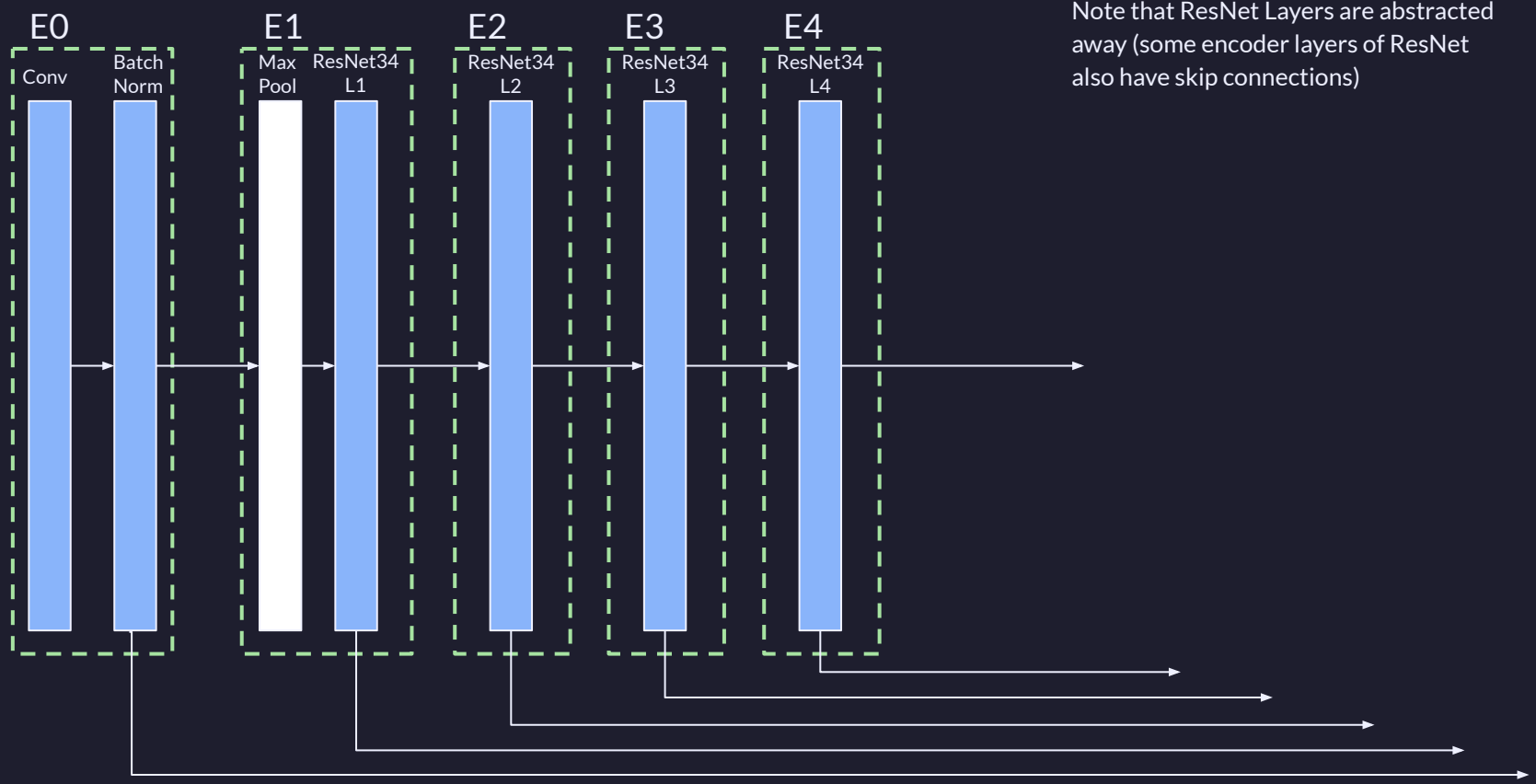
Q&A

➜ echo “Thank you”

Appendix: UNet Architecture

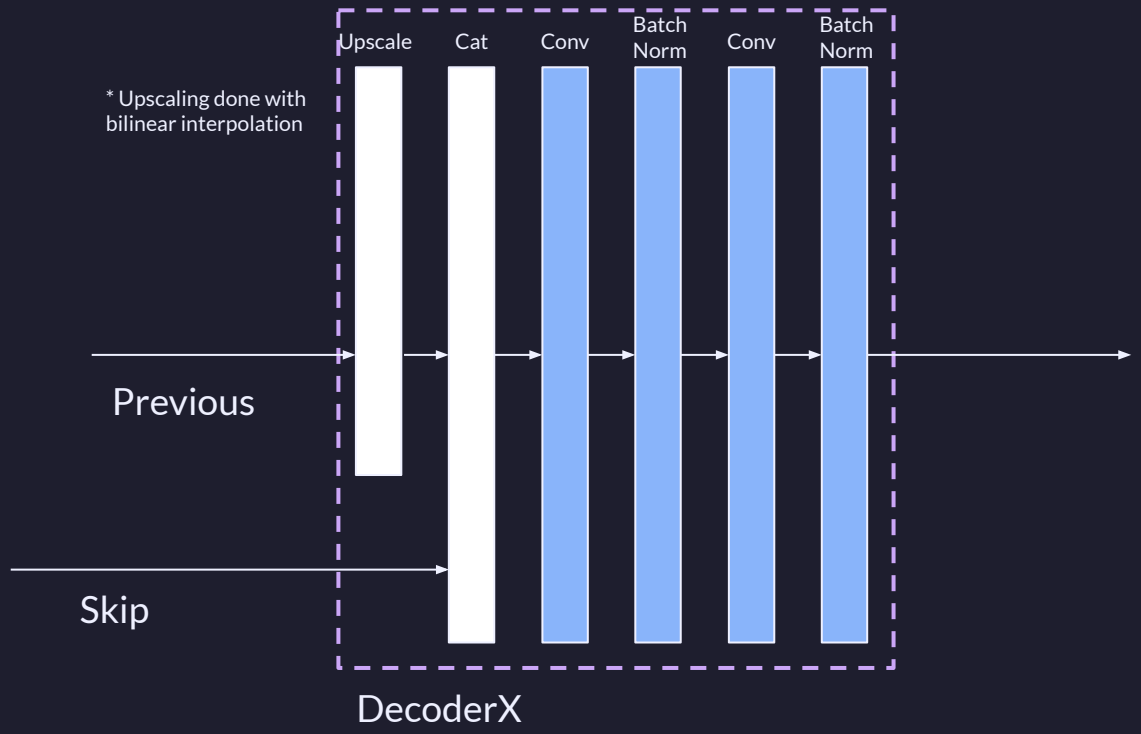
> An idiot admires complexity, a genius admires simplicity
- Terry Davis

Encoder Blocks



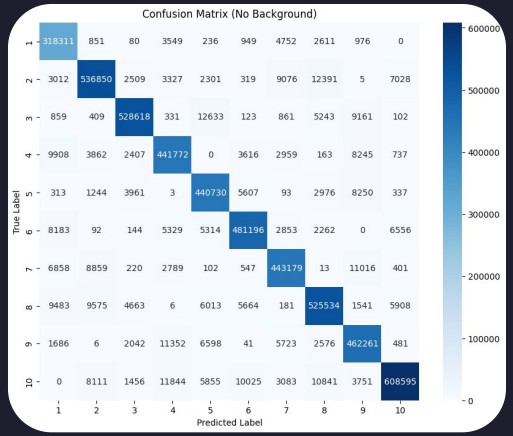
Note that ResNet Layers are abstracted away (some encoder layers of ResNet also have skip connections)

Decoder Block

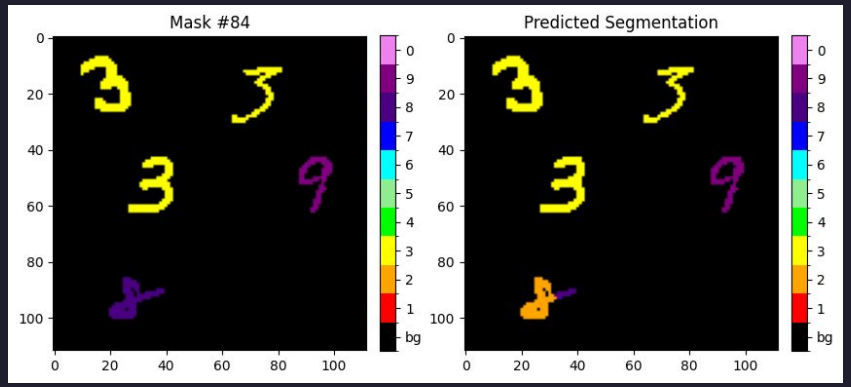


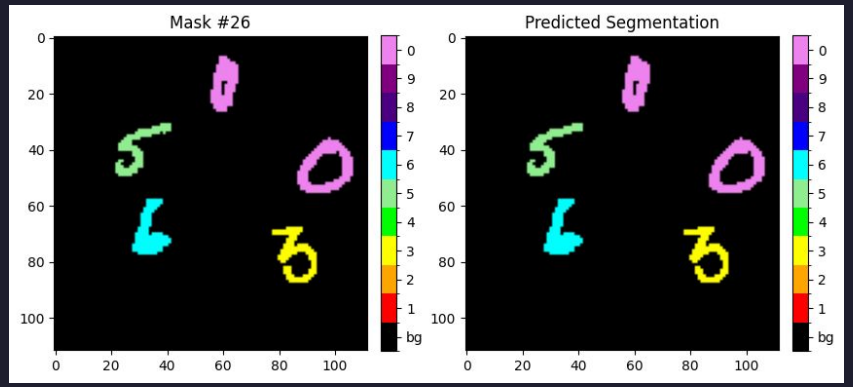
Results: Model Performance

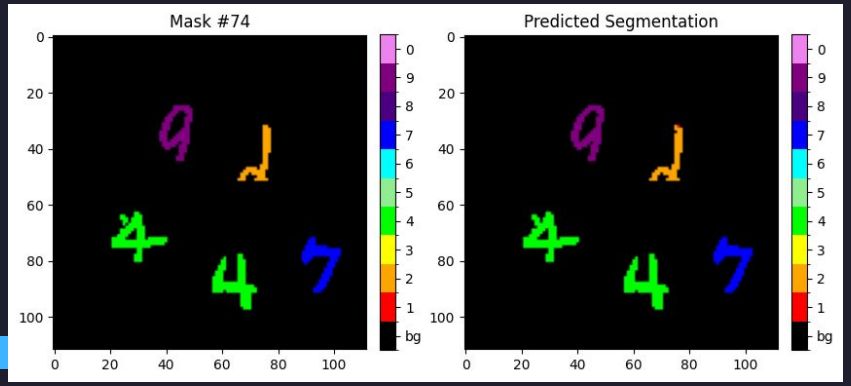
	Prec	Recall	F1	Acc
1	0.888	0.958	0.921	0.958
2	0.942	0.931	0.936	0.931
3	0.968	0.947	0.957	0.947
4	0.920	0.933	0.926	0.933
5	0.919	0.951	0.934	0.951
6	0.947	0.940	0.943	0.940
7	0.937	0.935	0.936	0.935
8	0.931	0.924	0.927	0.924
9	0.915	0.938	0.926	0.938
0	0.966	0.917	0.941	0.917

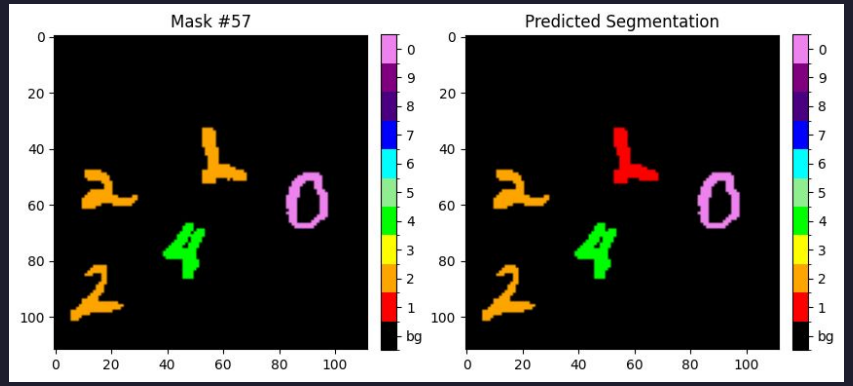


Results


Mask #84
Predicted Segmentation
0 20 40 60 80 100
0 9 8 7 6 5 4 3 2 1 bg


Mask #26
Predicted Segmentation
0 20 40 60 80 100
0 9 8 7 6 5 4 3 2 1 bg


Mask #74
Predicted Segmentation
0 20 40 60 80 100
0 9 8 7 6 5 4 3 2 1 bg


Mask #57
Predicted Segmentation
0 20 40 60 80 100
0 9 8 7 6 5 4 3 2 1 bg