Tech Stack & Project Usage Overview – Devanath D R
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1. Development Environment & Coding Tools

VS Code

- **Projects Used In:** IEEE Webpage (React + Tailwind + Vite), QMaster, HR Agent, AI Companion. Pretty much all of the programs I coded is using VS code
- **Strengths:** There are a lot of extensions that make things easy to do, The interface much easier to adapt and use. Very easy for GitHub syncing and stuffs
- **Limitations:** Hard to make some changes in the settings

Google Colab

- **Projects Used In:** Bird Classifier, Breast Cancer Prediction, Credit Card Fraud Detection, Coconut Maturity Detection, YOLOv5 Object Detection.
  Used mainly for train a model, since cloud based T4 GPU is there. Then those models are used in where it needed
- **Strengths:** Free GPU/TPU access, easy notebook sharing, seamless with PyTorch/TensorFlow.
- **Limitations:** Session timeouts and dependency installation repetition. Also storage of files is also little hard sometime.

Jupyter Notebook

- **Projects Used In:** ML experiments, YOLOv5 live detection, Kaggle datasets.
  Used mainly when do the data analytical and feature engineering part.
- **Strengths:** Great for iterative ML prototyping and visualization. Like the interface and features
- **Limitations:** Harder to scale to production, Hard to view on mobile devices.

Git & GitHub

- **Projects Used In:** All repositories.
  Since using a lot, Now know most of the functionalities.
- **Strengths:** Collaboration, version control, public showcase of work.
- **Limitations:** Requires discipline in branching/commits, Hard to correct some errors while committing. Managing Large files also hard.

Postman

- **Projects Used In:** HR Agent (testing FastAPI endpoints), QMaster (Flask API integration).
  Uses rarely -just for checking database integration stuffs.
- **Strengths:** Simplifies API debugging, CRUD testing.
- **Limitations:** Didn't felt any.

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2. Web Frameworks

HTML/CSS/JavaScript

- **Projects Used In:** Redesigned KTU homepage, HR Agent frontend.

Those projects which frontend is not that important or basic, I choose just basics like this
Know decent level.

- **Strengths:** Lightweight, quick prototyping.
- **Limitations:** Lacks scalability for dynamic apps without a framework.

React.js

- **Projects Used In:** IEEE webpage, QMaster frontend, Portfolio site.
  Uses this mainly, when the websites that build or projects that build should have good responsive interfaces. Uses different tools and libraries and code snippets
- **Strengths:** Component-driven, reusable UI, hooks simplify state management.
- **Limitations:** Steeper learning curve; requires backend for data-heavy apps.

Flask

- **Projects Used In:** QMaster backend (test generation), AI Companion backend.
  Like to use Python a lot, so often uses python based backend frameworks like this a lot. Flask is one of the most used by myself since it is very easy.
- **Strengths:** Easy integration with ML models, quick to prototype REST APIs.
- **Limitations:** Slower compared to FastAPI for async-heavy apps.

FastAPI

- **Projects Used In:** HR Agent backend.
  Since it comparatively new compared to other frameworks and tutorials and community support is less , didn't use any other projects.
  Decided to use in the HR agent backend, since it's much faster than Flask.
- **Strengths:** High-performance async support, automatic Swagger docs.
- **Limitations:** Smaller community vs Flask, fewer tutorials.

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3. AI / ML Frameworks

PyTorch

- **Projects Used In:** YOLOv5 object detection, Bird Classifier, Coconut Maturity Detector.
  Starte to learn about YOLO when I built the object detection setup. Then used it in various projects.
  Then learned more about PyTorch and tried to implement with the help of it.
- **Strengths:** Flexible, widely use -so good community support
- **Limitations:** Steeper learning curve

YOLOv5 / YOLOv8

- **Projects Used In:** YOLOv5 live detection, Coconut maturity detection.
  Image processing journey started with this, Used different versions along with the COCO datasets
- **Strengths:** State-of-the-art object detection, strong community.
- **Limitations:** GPU recommended for real-time performance.

OpenCV

- **Projects Used In:** YOLOv5 live detection, CV tasks.

- **Strengths:** Powerful image/video processing, easy integration with ML pipelines.
- **Limitations:** Hard to understand certain part.

Scikit-learn

- **Projects Used In:** Credit Card Fraud Detection, Breast Cancer Prediction.
  Started to use when I participated Kaggle competition on Titanic dataset, then followed up – learn about it more by doing other dataset predictions.
- **Strengths:** Classic ML library with pipelines, metrics, and prototyping ease.
- **Limitations:** Very handy,, But information on deep learning needed.

Pandas & NumPy

- **Projects Used In:** All ML projects.
  Uses a lot for the Kaggle dataset cleaning, mainly used in Credict card fraud detection dataset.
- **Strengths:** Data cleaning, preprocessing, feature engineering.
- **Limitations:** Memory-heavy for large datasets, Pandas is very hard to master it.

FastAI

- **Projects Used In:** Bird Classifier.
  Tried it recently for the first time.
- **Strengths:** High-level API over PyTorch for transfer learning.
- **Limitations:** Less flexible for custom architectures.

TensorFlow/Keras

- **Projects Used In:** Early ANN experiments.
  still learning this, learned how CNN's are built from the basics , how layers and algorithms for it are selected and implemented.
- **Strengths:** Beginner-friendly, good documentation.
- **Limitations:** I shifted to PyTorch for flexibility.

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4. Agentic AI Tools

LangChain

- **Projects Used In:** HR Agent (workflow orchestration).
  Tried many courses to learn this, Used in the recent HR resume project -and that is the first project implementation
- **Strengths:** Orchestrates LLM + tools, API integration
- **Limitations:** It just started to grow ,so hard to get community support.

CrewAI (Exploring)

- **Usage:** Still in learning phase.

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5. LLM Platforms

ChatGPT (GPT-4o)

- **Usage:** Daily for coding help, debugging, ideation.
- **Strengths:** Fast problem-solving, creativity.
- **Limitations:** Limit to input files.

Google Gemini Pro

- **Projects Used In:** HR Agent (interview scheduling), AI Companion chatbot.
- **Strengths:** Multimodal input, high-quality text responses, Easy to understand.
- **Limitations:** UI is often boring.

Mistral APIs

- **Usage:** Prompt testing and reasoning benchmarks.
  Used in Local implementaions.
- **Limitations:** Limited ecosystem compared to OpenAI/Gemini.

Hugging Face

- **Usage:** Model hosting and datasets.
- **Strengths:** Rich ecosystem.
- **Limitations:** Limited free hosting resources.

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6. AI Tools Frequently Used

- **ChatGPT** – For ideation, documentation, debugging.
- **Google Colab** – ML model training with GPUs.
- **Kaggle** – Dataset exploration, competitions.

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7. Cloud Platforms

Render,Vercel

- **Projects Used In:** AI Companion, IEEE website, Flask apps.
- **Strengths:** Easy deployment for backend apps.
- **Limitations:** Limited free tier resources.

Hugging Face Spaces

- **Projects Used In:** Small demo ML apps.
- **Strengths:** Gradio integration, community exposure.
- **Limitations:** Performance limited by free resources.

Firebase

- **Projects Used In:** Small web apps, basic prototypes.
- **Strengths:** Realtime DB and auth integration.

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8. Databases

MongoDB

- **Projects Used In:** HR Agent (resume DB), QMaster (test data).
- **Strengths:** Flexible schema, JSON storage.

- **Limitations:** Not optimal for relational queries.

PostgreSQL
- **Projects Used In:** Structured relational DB projects.
- **Strengths:** Strong relational DB features.
- **Limitations:** Heavier setup vs SQLite.

SQLite
- **Projects Used In:** Lightweight apps (Password Manager, Text Editor).
- **Strengths:** Simple, file-based DB.
- **Limitations:** Not scalable for large apps.

Firebase Realtime DB
- **Projects Used In:** Prototypes.
- **Strengths:** Quick setup, cloud-sync.
- **Limitations:** Limited querying and structure flexibility.
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Each tool listed has been experienced in real project contexts, giving me hands-on understanding of their advantages and limitations. This combination makes my skillset practical, adaptable, and ready for real-world challenges.