

Duch Panhathun

Software Engineer — AI/ML & Full-Stack

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PROFESSIONAL SUMMARY

Software engineer specialising in **applied machine learning and full-stack product engineering**, with production experience across AI platforms, fintech, e-commerce, and social-impact technology. Most recently **Python Engineer at Ailsa HQ Limited** (UK-based AI grant-funding platform) and **IT Consultant at Save the Children Cambodia** — holding both roles concurrently through 2026.

Depth across the full delivery stack: deep-learning computer vision (CNN and vision-transformer architectures), gradient-boosted tabular ML, embedding-based semantic matching, LLM integration, and distributed web scraping — paired with production backend and frontend engineering in Python/FastAPI, NestJS, and TypeScript/Next.js on AWS. Published researcher; Top-20 finalist among 100+ ASEAN teams in the Pan-SEA AI Developer Challenge 2025.

TECHNICAL SKILLS

Languages	Python, TypeScript, JavaScript, PHP, SQL
AI / Machine Learning	PyTorch, TensorFlow/Keras, scikit-learn, CatBoost, XGBoost, LightGBM · CNN & vision transformers (ConvNeXt, EfficientNet, Swin, Xception, DenseNet) · embeddings & vector search · RAG (LangChain, FAISS) · OpenAI & Anthropic APIs · feature engineering, cost-sensitive learning, class-imbalance handling
Backend	FastAPI, NestJS, Django REST Framework, Laravel, Node.js/Express, Next.js (Server Actions & API routes)
Frontend	Next.js, React, Angular, TypeScript, Tailwind CSS, Angular Material, Radix UI, Framer
Databases	MongoDB, PostgreSQL, MySQL, Supabase, Firebase/Firestore, Redis
Cloud & DevOps	AWS (EC2, ECS, Lambda, SQS, S3, EventBridge, CloudWatch, Parameter Store, Amplify, Route 53), Docker, GitHub Actions, Terraform, Vercel, Cloudflare R2, GCP
Integrations	Telegram Bot API & Mini Apps, Bakong KHQR / ABA PayWay, Auth0, Stripe, Google OAuth, EmailJS
Other	Web scraping & data extraction, data analysis & visualisation, REST API design, RBAC & authentication systems, on-page SEO & technical metadata

PROFESSIONAL EXPERIENCE

AI-powered grant-funding discovery and application platform (UK)

Engineer across a six-service platform helping businesses discover, match with, and apply for grant funding, with AI integrated throughout.

- **Built the platform's production scraping tier** — five funder-specific scrapers for major UK and EU funding bodies (EU Funding & Tenders Portal, EUREKA Network, Innovate UK, NIHR, Henry Royce Institute), each using a distinct extraction strategy: undocumented JSON API reverse-engineering, HTML parsing, hybrid headless-browser fallback, and sitemap-less crawling — with dedicated automated test coverage for each.
- **Designed the data-normalisation layer** mapping five heterogeneous funder sources onto one shared grant model, plus a compatibility adapter bridging a new structured schema onto the platform's legacy MongoDB schema.
- **Built an LLM-based classification and structured-extraction layer**, provider-agnostic across OpenAI and Anthropic, filtering scraped page content down to relevant application-form data.
- **Contributed to the AI grant-matching / curation engine**, matching funding opportunities to company profiles using embedding-based vector search, and built machine learning for opportunity-to-company matching.
- **Bootstrapped and served as primary engineer for the customer-facing SaaS application** (Next.js 16 / React 19 / TypeScript) from an empty repository — authoring the founding commit and **~62% of all commits** — including its Server Actions data layer, Auth0 authentication, and AWS Amplify deployment pipeline.
- **Designed a department- and section-level access-control system** for collaborative grant applications, deriving section ownership transitively from user–department membership rather than requiring a schema migration, enforced consistently across both the admin tool and the customer app.
- **Designed a service-to-service authentication mechanism** enabling an external AI agent to securely report structured data back into the production API.
- **Implemented an asynchronous scraping pipeline** using AWS SQS dispatch with MongoDB-backed status tracking and audit logging, supporting both standard and AI-agent-driven extraction modes.

Python/FastAPI microservices · Next.js (frontend + backend) · Node.js/Express API gateway · MongoDB · AWS (EC2, ECS, Lambda, SQS, S3, EventBridge, CloudWatch, Parameter Store, Amplify, Route 53) · Auth0 · OpenAI & Anthropic APIs · Docker, Terraform, GitHub Actions

Plant Disease Recognition (AI/ML)

- **Trained deep-learning and machine-learning models for crop disease recognition**, deployed through a Telegram chatbot that identifies diseases in the cucumber and cauliflower families and recommends treatment — **achieving higher accuracy than comparable published research**.
 - *Cauliflower family*: Xception, DenseNet121
 - *Cucumber family*: ConvNeXt-Large, EfficientNet-B5, Swin-B
- Built complete training pipelines in both **PyTorch** and **TensorFlow/Keras** — focal loss for class imbalance, mixed-precision training, cosine learning-rate scheduling, stratified splitting, and augmentation/oversampling — resolving non-trivial Keras 3.x / HuggingFace-transformer compatibility issues.
- Built a **weather advisory microservice** (government meteorological data + Windy API, Khmer-language localisation) deployed as a scheduled scraper and REST API, integrated into the chatbot.
- Built and deployed the **admin/CMS dashboard** (Next.js, bilingual Khmer/English, Docker/PM2 production deployment, automated weather-alert cron jobs).

Coffee Business Management System

- **Built an end-to-end system to run a coffee business**, spanning a point-of-sale terminal, ERP dashboard, customer ordering website, and Telegram Mini App.
 - *POS & ERP dashboard* (Angular + NestJS) — cashier terminal with dual-currency (USD/KHR) denomination-level cash handling, plus back-office payroll, purchasing, profit-and-loss reporting, and a recipe-costing engine computing live food-cost margins from ingredient stock.
 - *Customer ordering website* (Next.js + NestJS) — menu ordering, stored-value wallet, and a gamified loyalty system (points, rank tiers, missions, collectible stamps).
 - *Telegram Mini App* (TypeScript) — conversational ordering, account linking, and order notifications.
- **Integrated Cambodian QR payment rails** (Bakong/KHQR and ABA PayWay), including QR intent generation, polling-based settlement, and bank-app deep-linking.
- **Integrated OpenAI structured-output generation** into the loyalty system to assign personalised customer reward badges, with strict validation against a closed catalogue and deterministic fallback so an AI failure can never break a transaction.
- **Implemented an idempotency-key interceptor** making payment-mutating API endpoints safe against client retries and duplicate submissions.

PyTorch, TensorFlow/Keras, Python · Angular, NestJS, Next.js, TypeScript · Sequelize/PostgreSQL · Telegram Bot API & Mini Apps · Socket.IO · Docker

IT Intern — Save the Children Cambodia

1 Feb 2024 – 1 Mar 2025

- **Built the Remote Positive Parenting platform** — a Khmer-language website and Telegram chatbot broadcasting parenting and child-protection guidance to parents. Developed the admin content-management system (multi-format media upload, rich-text editing, dynamic admin-extensible tagging) and a **campaign and quiz broadcast scheduler** allowing staff to queue timed messages for delivery. (*ReactJS, Firebase*)
- **Built a machine-learning model for plant disease recognition** for the cucumber family, served through a Telegram chatbot for disease identification and treatment recommendation. (*Python, Flask*)
- **Built the Partnership Management System** for managing partnership records and organisational relationships — including a four-level Cambodian administrative geography hierarchy (province → district → commune → village) with cascading dependent address selection, multi-file document management, a report submission and review workflow, and role-based access control. Authored **~85% of both the backend and frontend** codebase. (*Laravel backend, Next.js frontend, PostgreSQL, Docker*)

SHORT-TERM CONTRACTS & FREELANCE

Data Collector — Vikasa Advisory and Academy

28 Apr – 8 May 2026

Web Development Consultant — CCYMCR

16 – 30 Mar 2026

Cambodia Children and Young People Movement for Child Rights

- Built the organisation's website with a **hand-built content management system** spanning ~30 independently editable content sections, allowing non-technical staff to update all site content live without a third-party CMS.
- Fully bilingual (English/Khmer) content architecture, an interactive province map of the organisation's operating areas, a partner-network directory, and a donor-facing financial transparency section.

Next.js · Supabase (PostgreSQL) · Tailwind CSS · Leaflet · Vercel

Web Developer — Garden Options

16 – 30 Dec 2025

Family-run landscaping and garden design company, Scottish Borders, UK

- Built and published a **single-page, conversion-focused marketing website** in Framer, live on a custom domain — structured as a trust-building funnel (credibility statistics → services → project gallery → testimonials → objection-handling FAQ → enquiry form).
- **Developed a custom React code component for the contact form** within Framer's code-override system — controlled inputs, client-side validation, an async idle/sending/success/error state machine, and a live **EmailJS** API integration delivering enquiries straight to the client's inbox with no backend server required.
- Implemented **breakpoint-specific layouts rather than simple reflow** — an interactive, image-synced accordion for the desktop services section, replaced by a simplified stacked layout on tablet and mobile better suited to touch interaction.
- Built reusable parametrised components (animated statistic counters, accordions, review cards), scroll-triggered entrance animations, an auto-scrolling testimonials marquee, and a lazily-hydrated project gallery keeping the heaviest visual section out of the initial page load — plus full on-page SEO (metadata, Open Graph/Twitter Card, canonical URL, sitemap, robots).

Framer · custom React code components · EmailJS · Phosphor Icons

Freelance Data Interpretation — CWEA Project

28 Mar – 1 May 2025

Data interpretation and visualisation. (*Python, Excel*)

Freelance Data Collector — Confluences Asie Co., Ltd.

12 Sep – 2 Oct 2023

RESEARCH

Improving Online Payment Fraud Detection with Feature Engineering and Cost-Sensitive Machine Learning

8 Jun 2025

Royal University of Phnom Penh · DOI: 10.5281/zenodo.15618190

- Designed an end-to-end machine-learning pipeline for financial fraud detection on a **6.36-million-transaction dataset**, engineering domain-specific behavioural and temporal features (account-draining detection, empirically-derived hourly risk tiers, balance-matching flags).
- Applied statistical outlier analysis with z-score flagging and winsorisation to preserve anomaly signal while controlling extreme-value noise.
- Compared six algorithms — **CatBoost, XGBoost, LightGBM, Random Forest, K-Nearest Neighbors, and Logistic Regression** — addressing severe class imbalance through cost-sensitive class weighting rather than synthetic oversampling.
- Achieved **99.96% ROC-AUC and 99.79% F1-score** with CatBoost, with quantified train/test overfitting analysis confirming generalisation — **outperforming the comparable published studies benchmarked against**.
- Published independently on Zenodo (CC-BY 4.0) and indexed on ResearchGate.

EDUCATION

Bachelor of Information Technology Engineering

Graduated 22 May 2025

Royal University of Phnom Penh

General English Program — Level 14

1 Dec 2020

Stanford American School

English Program — Level 12

13 Jun 2019

Arizon School

ACHIEVEMENTS & AWARDS

Top 20 — Pan-SEA AI Developer Challenge 2025 (AI Singapore) · 22 Oct 2025

Placed among 100+ teams across ASEAN for an AI platform addressing real-world challenges; awarded **USD 10,000 in AWS credits** to further develop and scale the solution.

International Seminar Delegate, China · 7 – 20 Aug 2024

Selected as **1 of 8 participants** to attend an international seminar on *Management and Protection of Nature Reserves* for Belt & Road Initiative countries.

Gold Medal — NAVA-Thon Hackathon · 22 Dec 2023

Awarded for a Telegram chatbot promoting positive parenting and child protection to combat violence against children.

NICC 9th Startup Camp (ICT) · 19 – 22 Jun 2023

Completed the training course and achieved the required level of competence.

Samsung Innovation Campus Scholarship · 5 Apr 2022

Selected among the top 60 students nationally for an ICT programme covering Python (basic to advanced) and data analysis.

Silver Medal — Angkor Mathematics Cambodia · 15 Jan 2022

Awarded among 2,000+ participants.

Mathematics Outstanding Student Cambodia · 15 Oct 2021

One of the top finalists in the national Mathematics Outstanding Student examination.

VOLUNTEER EXPERIENCE

Registration & Protocol Team — 22nd ASJA–ASCOJA–JAC Symposium	28 Jun 2024
Ceremony Volunteer — SEA Games & ASEAN Para Games opening and closing ceremonies	5 May – 9 Jun 2023
Protocol Support — Earth Hour event	23 Mar 2023
Event Organising Assistant — Angkor Mathematics Cambodia	19 Feb 2023
Event Organising Assistant — Math Kangaroo Cambodia	11 Dec 2022

REFERENCE

References available on request.