

CAREER TRANSITION TO ARTIFICIAL INTELLIGENCE

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Outline

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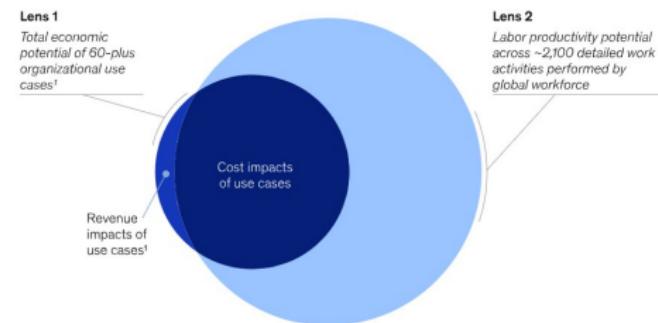
Career in AI: Background



Current State: The Generative Era

- ▶ Goldman Sachs projects AI could add \$7 trillion to global GDP over 10 years (by 2033)
- ▶ Latest job impact: World Economic Forum 2024 report shows 83M jobs displaced but 69M created by 2027

The potential impact of generative AI can be evaluated through two lenses.



¹For quantitative analysis, revenue impacts were recast as productivity increases on the corresponding spend in order to maintain comparability with cost impacts and not to assume additional growth in any particular market.

McKinsey & Company

(Ref: The economic potential of generative AI – McKinsey)

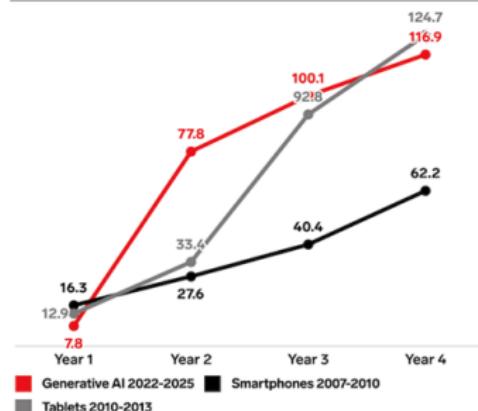


The Pace of Innovation: Breaking Records

- ▶ **Time to 100 Million Users:**
 - ▶ Mobile Phones: 16 years
 - ▶ Internet: 7 years
 - ▶ Instagram: 2.5 years
 - ▶ ChatGPT: 2 months
- ▶ Skill half-life: 2.5 years (overall), 3-4 months (AI-specific)
- ▶ New economic shift: "From Automation to Augmentation to Autonomy", the rise of AI agents

Generative AI Has a Steeper Initial Adoption Curve Than Other Recent Technologies

millions of US users



Note: individuals of any age who use each technology at least once per month; Year 1 for smartphones corresponds with the June 2007 release of the iPhone; Year 1 for tablets corresponds with the April 2010 release of the iPad; Year 1 of generative AI corresponds with the November 2022 release of ChatGPT
Source: Insider Intelligence, June 2023

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Insider Intelligence | eMarketer

(Ref: Similarweb 2024, Anthropic Usage Stats 2024)

The Three Waves of Modern AI

- ▶ **Wave 1: Predictive AI (2010-2021)**
 - ▶ Classification, Regression, Clustering
 - ▶ Traditional ML: Random Forests, XGBoost, Neural Networks
 - ▶ Use case: Predict customer churn, fraud detection
- ▶ **Wave 2: Generative AI (2022-2024)**
 - ▶ Text generation (GPT), Image generation (DALL-E, Midjourney)
 - ▶ Foundation models trained on internet-scale data
 - ▶ Use case: Content creation, code generation, chatbots
- ▶ **Wave 3: Agentic AI (2024+)**
 - ▶ Autonomous decision-making, multi-step reasoning
 - ▶ AI agents that can plan, execute, and learn
 - ▶ Use case: AI employees, research assistants, autonomous systems



(Ref: AI Series Part 3: The Three Waves of AI - Medium)

(Ref: Sequoia Capital AI Market Analysis 2024)

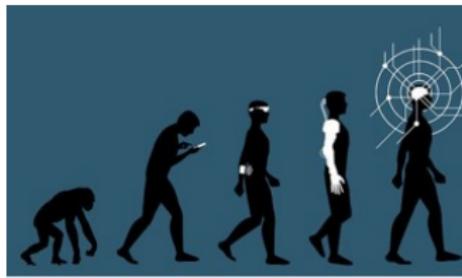
Impact Examples

Less mechanical, automatable

- ▶ Bill and account collectors
- ▶ Data entry operators
- ▶ Computer network support
- ▶ Administrative assistants
- ▶ Insurance sales agents

More Cognitive, Creative, Human

- ▶ Software developers
- ▶ Human resources managers
- ▶ Psychologists
- ▶ Sportsman
- ▶ Nurses, care



(Source: The Simplistic Debate Over Artificial Intelligence – Preston
Estep)

Changes

Technological

- ▶ AI deluge
- ▶ Digitization → Data + APIs
- ▶ Remote *

Social

- ▶ Over interaction + isolation
- ▶ Obsolete roles, emergence of new
- ▶ Lifelong re-skilling



(Source: Rise of the Chatbots: How AI Changed Customer Service – Salesforce.com)

Financial

- ▶ Widening gap
- ▶ Flatter world
- ▶ Gigs over jobs

Introduction to AI



Data Science, Artificial Intelligence is critical in bringing intelligent automation



What are Data Sciences?

ie What is Artificial Intelligence? Machine Learning? Deep Learning?

Data Science

- ▶ Science of Data (obviously)
- ▶ Use of Data for Applications
- ▶ Some parts of AI uses Data to find patterns and insights which are helpful in multiple applications
- ▶ Machine and Deep Learning that part of AI that leverages data.

So, more on AI-ML here ...



"Houston, we have a problem!!"



50 Years Ago: "Houston, We've Had a Problem" – John Uri

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Whats the Problem?

- ▶ Along with some softer words like “disruption”, “passionate”, “excited” ...
- ▶ If you don't have word “innovation” in your talk/speech/conversation it's BIG problem.
- ▶ Irrespective of fields. You can be Corporate, Political, Social, etc.

And there is an addition of one more word, which is a must in every talk...and that is?

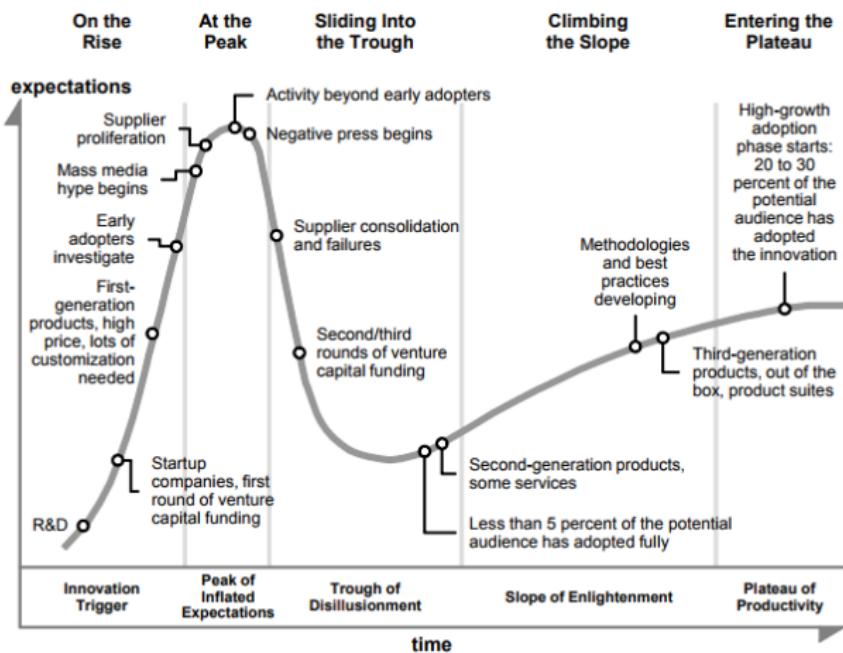
“AI”



The Problem

- ▶ Every company is claiming to be working in AI-ML
 - ▶ Is it so?
 - ▶ What exactly is AI (ML)?
 - ▶ What is not AI?
- ▶ Or is it just a plain BIG hype?

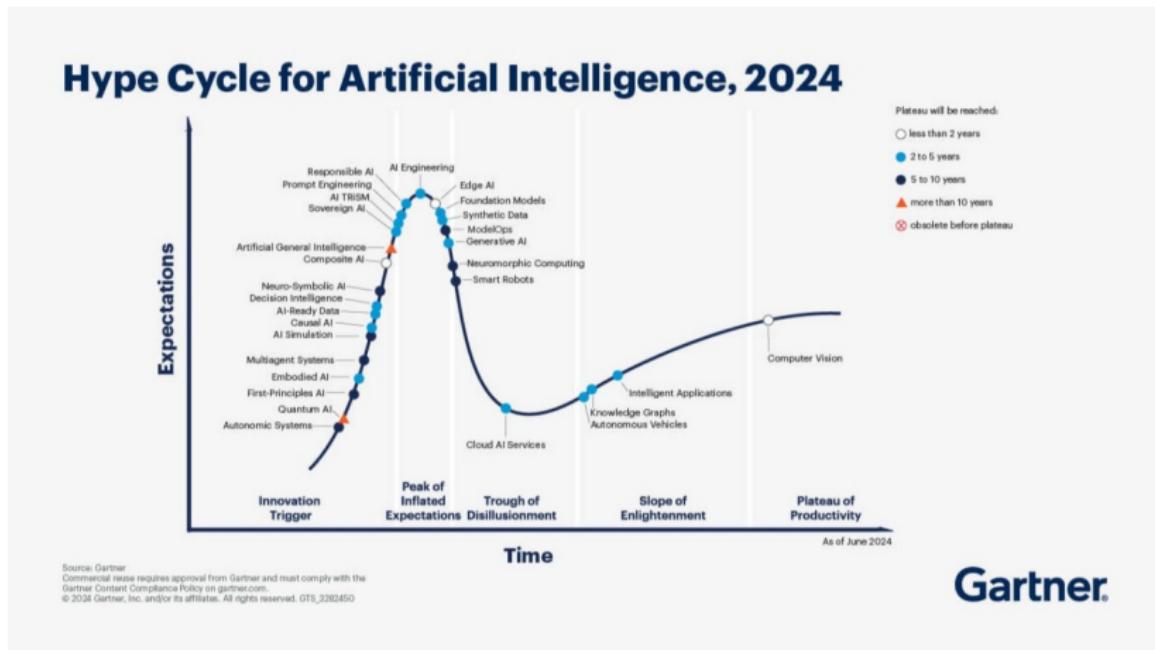
Technology Phases



Source: Gartner

(Ref: Understanding Gartner's Hype Cycles - Jackie Fenn, Mark Raskino, Betsy Burton)

2024 Hype Cycle



(Ref: Understanding Gartner's Hype Cycles - Jackie Fenn, Mark Raskino, Betsy Burton)

What are the signs of being at the peak?

- ▶ Featured on the front cover of every business magazine.
- ▶ Marketplace is flooded with offerings.
- ▶ The technology is viewed as a panacea, without any regard to its suitability.
- ▶ Peer pressure on companies to adopt, without understanding challenges and risks

(Ref: Understanding Gartner's Hype Cycles - Jackie Fenn, Mark Raskino, Betsy Burton)

Bosses



(Ref: Dilbert)

What do we do at such times?

- ▶ Wait till everything plays out?
- ▶ Or get on the bandwagon, test the waters?
- ▶ Choice can be anything, but better to make an informed decision.

What is so different?

- ▶ Just another set of problem solving techniques.
- ▶ Using the knowledge to solve problems,
- ▶ either in better manner
- ▶ or tackle completely unsolvable problems

What is the Core Idea?

What's the core idea?

- ▶ behind problem solving?
- ▶ behind writing software algorithms?
- ▶ solving research problems?

Desire

- ▶ To find a “function”
- ▶ To find a relation
- ▶ To find a transformation
- ▶ To build a model
- ▶ From given inputs to desired outputs.

That's it.

Functions

- ▶ Some functions are straight forward
- ▶ "*In summer, ice-cream sale goes up*"
- ▶ Cause and effect
- ▶ Relation (function, Mathematical model) is found out
- ▶ Here, simple rule based programming suffices

Functions

- ▶ But some functions are complex
- ▶ *"More you put efforts, your business flourishes."*
- ▶ Cause and effect again, but the relation is far to complex
- ▶ Too many variables
- ▶ Here, simple rule based programming not humanly possible.
- ▶ Lots of research needed to come up with equations.

Functions

- ▶ $E = mc^2$
- ▶ What's this? a function?
- ▶ Input variable(s)?
- ▶ Output variable(s)?
- ▶ Parameters?
- ▶ How's the relation? linear?

Functions

- ▶ But most real-life functions are not deterministic
- ▶ Some are probabilistic, some non-linear.
- ▶ *“Detecting if the tumor is benign or malignant”*
- ▶ *“At any state in the game of chess, what's the next move?”*

Chess: next move?

- ▶ Needs extreme expertise
- ▶ Needs “intelligence”
- ▶ How do you get that?
 - ▶ Built by lots of training.
 - ▶ By studying lots of past games.
- ▶ This is how Humans build intelligence

Intelligence

- ▶ Can machine (software/program) also do the same?
- ▶ Can it play chess?
- ▶ Can it build intelligence?
- ▶ By looking at past experiences (data),
- ▶ Training Data: games played, moves used, etc.

Yes, it can!! Thats Artificial Intelligence.

What is AI?



What is Artificial Intelligence (AI)?

My definition:

“If machines (or computer programs) start doing some/all of these “intelligent” tasks, then that’s Artificial Intelligence”



Intelligence: the differentiation

- ▶ Ability to think various domains
- ▶ Ability produce something new
- ▶ Ability to detect the unseen
- ▶ Ability to enhance knowledge (rules, patterns)

All these, AI has started doing. The AI era has arrived!!

Everyday usage

Artificial intelligence seems to have become ubiquitous.

- ▶ Replying to our emails on Gmail
- ▶ Learning how to drive our cars,
- ▶ Sorting our holiday photos.
- ▶ etc.

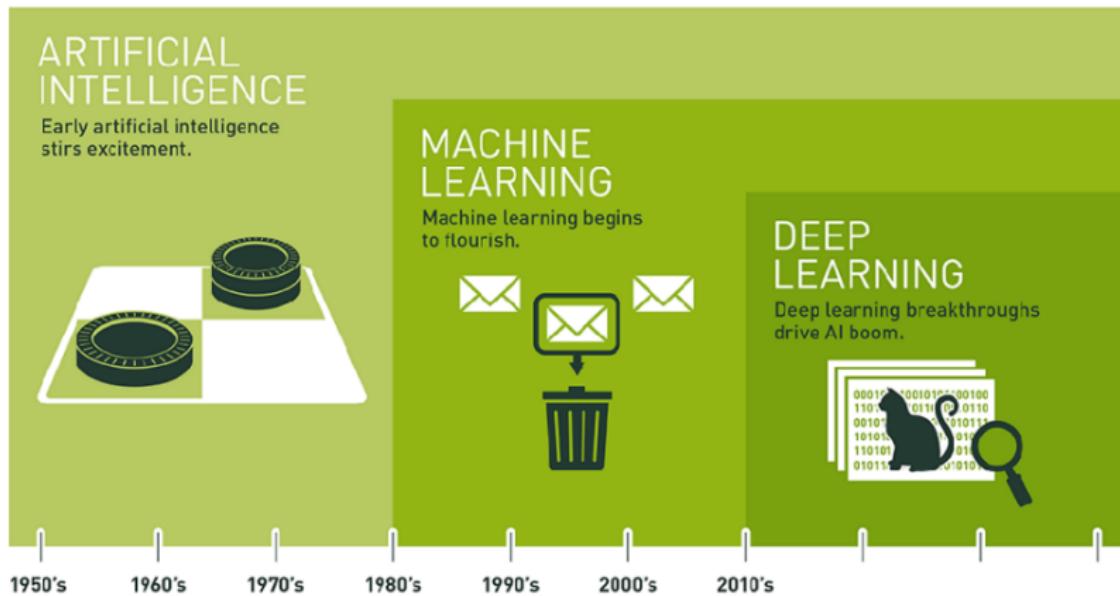
Too good to be true, isn't it, sort of Magical !!

But then ...

- ▶ When its too good, you start suspecting
- ▶ Is it for real!!
- ▶ How can such thing happen?
- ▶ How far will it go?

The next thing you know, people are worrying about exactly how and when AI is going to doom humanity.

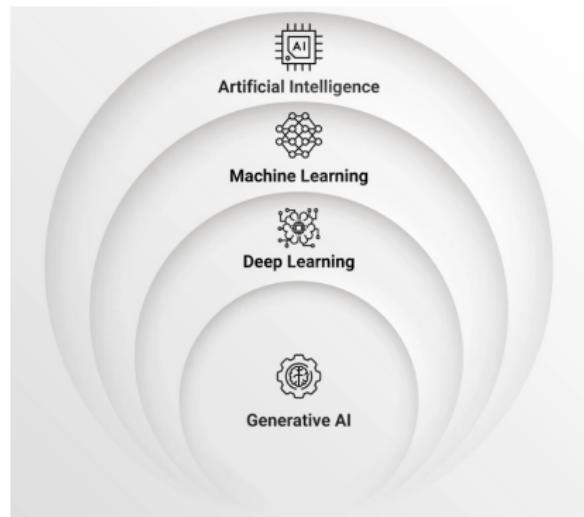
Relationship between AI, ML, DL



(Ref: <https://blogs.nvidia.com/blog/2016/07/29/whats-difference-artificial-intelligence-machine-learning-deep-learning-ai/>)

The Modern AI Hierarchy

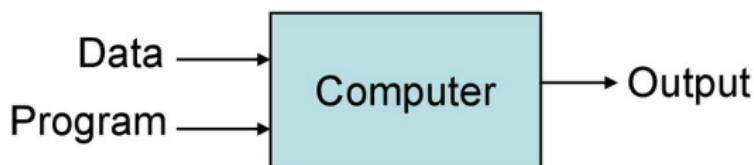
- ▶ **Artificial Intelligence (AI):** Machines mimicking human intelligence.
- ▶ **Machine Learning (ML):** Learning from data without explicit programming.
- ▶ **Deep Learning (DL):** Neural networks with many layers.
- ▶ **Generative AI (GenAI):** DL models that can *create* new content (text, code, images) rather than just analyzing existing data.



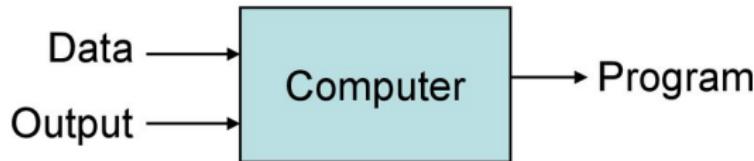
(Ref: AI, ML, DL, and Generative AI Face Off: A Comparative Analysis - Synoptek)

Traditional vs. Machine Learning?

Traditional Programming



Machine Learning



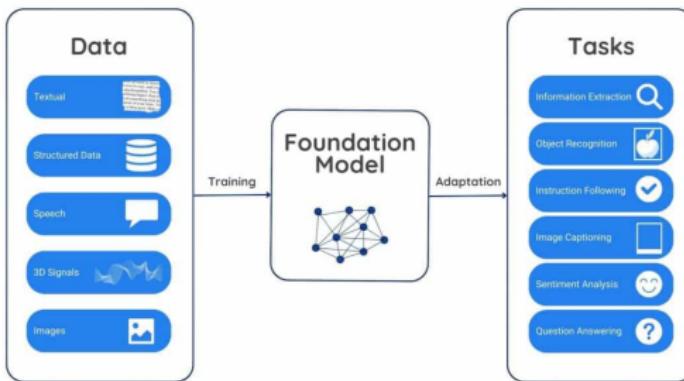
Why Machine Learning?

- ▶ Problems with High Dimensionality
- ▶ Hard/Expensive to program manually
- ▶ Techniques to model 'ANY' function given 'ENOUGH' data.
- ▶ Job \$\$\$



Paradigm Shift: Foundation Models

- ▶ **Old Way (Pre-2022):** Train a specific model for a specific task (e.g., sentiment analysis model, translation model). Requires massive labeled data.
- ▶ **New Way (Post-2022):** Train one massive "Foundation Model" (e.g., GPT-4, Llama 3) on the whole internet.
- ▶ **Adaptation:** Fine-tune or "Prompt" this foundation model for almost ANY task.



(Ref: The Guide to Foundation Models in Modern AI Development - Visio ai)

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The AI Model Landscape

Proprietary Models:

- ▶ **OpenAI:** GPT-4o, o1, o3
- ▶ **Anthropic:** Claude 3.5 Sonnet (Best for coding)
- ▶ **Google:** Gemini 2.0 Flash (Native multimodal)
- ▶ **xAI:** Grok 2 (Real-time data access)

Open Source/Weights:

- ▶ **Meta:** Llama 3.3 70B
- ▶ **Mistral:** Mistral Large 2, Codestral
- ▶ **Qwen:** Qwen 2.5 (Multilingual)
- ▶ **DeepSeek:** DeepSeek-V3 (Reasoning)

Key Insight: Models are commoditizing. Your value is in application development, not model training.

(Ref: LMSYS Chatbot Arena Leaderboard, Hugging Face Model Hub - Nov 2024)



Multimodality

AI is no longer just text or even text + images.

Native Multimodal Understanding:

- ▶ **Input:** Text, Images, Audio, Video, PDFs, Code
- ▶ **Output:** Text, Code, Images, Audio, Structured Data
- ▶ **Processing:** Simultaneous understanding across modalities

Capabilities:

- ▶ GPT-4o: Real-time voice with emotion detection
- ▶ Gemini 2.0: Live video analysis (see what you see)
- ▶ Claude 3.5: Artifacts with interactive UI generation
- ▶ Sora: Text to video (limited access)

Real-world Example: Show phone camera to AI: "What ingredients do I have?" → Get recipe + cooking video

Why now?

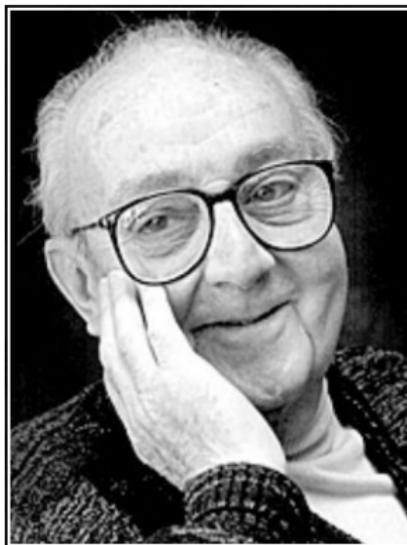
- ▶ Flood of data (Internet, IoT)
- ▶ Increasing computational power
- ▶ Easy/free availability of algorithms
- ▶ Increasing support from industries

Limits on Artificial Intelligence

- ▶ Many things still beyond the realm of AI
- ▶ No thinking computers
- ▶ No Abstract Reasoning
- ▶ Often AI systems Have Accuracy Limits
- ▶ Many things difficult to capture in data
- ▶ Sometimes Hard to interpret Systems

After all this - The Truth ...





All models are wrong, but some are useful.

— *George E. P. Box* —

AZ QUOTES

Career in AI: Roles



Data Science Roles

- ▶ Data Scientist
- ▶ Data Analyst
- ▶ Data Architect
- ▶ Data Engineer
- ▶ AI Engineer
- ▶ AI-Augmented Professional

(Ref: The different data science roles in the industry - Martijn Theuwissen, DataCamp)

Data Scientist Role

Able to handle the raw data, analyzing that data with the help of statistical techniques, to sharing his/her insights with his peers in a compelling way. Focus more on "Fine-tuning models" and "Data Curation" rather than just building models from scratch.



(Ref: The different data science roles in the industry - Martijn Theuwissen, DataCamp)

Data Analyst Role

The data analyst is the Sherlock Holmes of the data science team.

DATA ANALYST
'DATA DETECTIVE'

Role
Collects, processes and performs statistical data analyses

Mindset
Intuitive data junkie with high "figure-it-out" quotient

Languages
R, Python, HTML, Javascript, C/C++, SQL

Skills & Talents

- ✓ *Spreadsheet tools (e.g. Excel)*
- ✓ *Database systems (SQL and NO SQL based)*
- ✓ *Communication & visualization*
- ✓ *Math, Stats, Machine Learning*

HIRED BY

IBM

(Ref: The different data science roles in the industry - Martijn Theuwissen, DataCamp)

Data Architect Role

Creates the blueprints for data management systems to integrate, centralize, protect and maintain the data sources.

The infographic is titled "DATA ARCHITECT: THE CONTEMPORARY DATA MODELLER". It features a central illustration of a person with large white eyes and a red circular background. Below the illustration, the text "HIRED BY" is followed by logos for VISA, Coca-Cola, and logitech. To the left of the central figure, there is a section titled "Languages" listing SQL, XML, Hive, Pig, and Spark. Another section titled "Skills & Talents" lists several bullet points: ✓ Data warehousing solutions, ✓ In-depth knowledge of database architecture, ✓ Extraction Transformation and Load (ETL), spreadsheet and BI tools, ✓ Data modeling, and ✓ Systems development. To the right of the central figure, the "Role:" is described as "Creates blueprints for data management systems to integrate, centralize, protect and maintain data sources". The "Mindset:" is described as "Inquiring ninja with a love for data architecture design patterns".

Languages
SQL, XML, Hive, Pig, Spark

Skills & Talents

- ✓ Data warehousing solutions
- ✓ In-depth knowledge of database architecture
- ✓ Extraction Transformation and Load (ETL), spreadsheet and BI tools
- ✓ Data modeling
- ✓ Systems development

DATA ARCHITECT
THE CONTEMPORARY DATA MODELLER

Role:
Creates blueprints for data management systems to integrate, centralize, protect and maintain data sources

Mindset:
Inquiring ninja with a love for data architecture design patterns

HIRED BY

VISA Coca-Cola logitech

(Ref: The different data science roles in the industry - Martijn Theuwissen, DataCamp)

Data Engineer Role

Has a background in software engineering and loves to play around with databases and large –scale processing systems.

The infographic is titled "DATA ENGINEER" and describes them as "SOFTWARE ENGINEERS BY TRADE". It features a central cartoon character wearing a hard hat and safety glasses, with the text "HIRED BY" below it, followed by logos for Spotify, Facebook, and a stylized letter 'a'.

Role
Develops, constructs, tests and maintains architectures (such as databases and large-scale processing systems)

Mindset
All-purpose everyman

Languages
SQL, Hive, Pig, R, Matlab, SAS, SPSS, Python, Java, Ruby, C++, Perl

Skills & Talents

- ✓ Database systems (SQL & NO SQL based)
- ✓ Data modeling & ETL tools
- ✓ Data APIs
- ✓ Data warehousing solutions

(Ref: The different data science roles in the industry - Martijn Theuwissen, DataCamp)

LLM Ops Engineer (ML Ops 2.0)

What Changed from ML Ops:

- ▶ Less about model training pipelines
- ▶ More about LLM deployment at scale
- ▶ Focus on inference optimization
- ▶ Cost management (inference is expensive!)
- ▶ Quality monitoring (hallucinations)
- ▶ Implement caching strategies (reduce API costs 50-90%)

(Ref: The Rise of LLMOps - Chip Huyen)

Core Responsibilities:

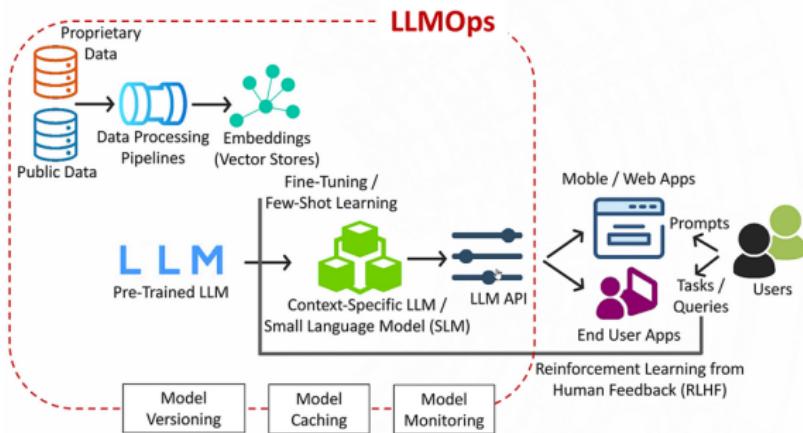
- ▶ Deploy and serve LLMs (OpenAI, Anthropic, self-hosted)
- ▶ A/B test different models for cost/quality tradeoffs
- ▶ Monitor latency, costs, and output quality
- ▶ Build evaluation pipelines (automated testing)
- ▶ Manage vector databases and embedding workflows



LLM Ops Engineer (ML Ops 2.0)

Tools:

- ▶ Monitoring: LangSmith, Helicone, Arize
- ▶ Serving: Anyscale, Together AI, Modal
- ▶ Evaluation: RAGAS, DeepEval
- ▶ Caching: Redis, GPTCache



(Ref: LLM Ops Pipelines with Kubeflow)

Salary Range:

- ▶ India: Rs 25-50 LPA
- ▶ US: \$150K-\$220K

(Ref: The Rise of LLMOps - Chip Huyen

)

AI Product Manager: Bridge between business and AI

Core Skills:

- ▶ Understanding of LLM pros & cons
- ▶ Prompt engineering (hands-on experience)
- ▶ Product strategy for AI applications
- ▶ Understanding of AI costs and scaling
- ▶ User research for AI interactions
- ▶ Ethical AI and bias mitigation

Typical Responsibilities:

- ▶ Define product requirements for AI
- ▶ Design conversational UI/UX flows
- ▶ Evaluate model choices
- ▶ Balance cost vs quality tradeoffs
- ▶ Measure AI feature success metrics
- ▶ Coordinate between stakeholders

Success Examples:

- ▶ Perplexity: AI search
- ▶ Notion AI: Writing assistant
- ▶ Cursor: AI code editor
- ▶ Harvey: Legal AI

Salary Range:

- ▶ India: Rs 30-60 LPA
- ▶ US: \$180K-\$280K

Entry Path: Best for domain experts who want to transition without deep coding. Need to build AI prototypes but not production systems.

(Ref: Lenny's Newsletter - AI PM Deep Dive)



The AI Engineer: Build AI-powered applications

Core Skills:

- ▶ Prompt Engineering & Chain-of-Thought reasoning
- ▶ RAG (Retrieval Augmented Generation) implementation
- ▶ Vector databases (Pinecone, Weaviate, Chroma)
- ▶ LLM orchestration (LangChain, LlamaIndex)
- ▶ API integration (OpenAI, Anthropic, Google)
- ▶ Evaluation frameworks (LLM-as-a-Judge, RAGAS)

Typical Day:

- ▶ Design prompt chains for complex workflows
- ▶ Build RAG systems for knowledge bases
- ▶ Optimize context windows and token usage
- ▶ A/B test different models for cost/quality
- ▶ Debug hallucinations and edge cases



The New Hot Role

Why Hot:

- ▶ 10x growth in job postings
- ▶ Every company needs AI apps NOW
- ▶ Lower barrier than ML Engineer
- ▶ High demand, low supply

Salary Range:

- ▶ India: Rs20-60 LPA
- ▶ US: \$120K-\$250K

(Ref: LinkedIn Emerging Jobs Report , Levels.fyi)



Prompt Engineer / AI Whisperer

Design, test, and optimize prompts for complex AI workflows.

Core Skills:

- ▶ Advanced prompting techniques (CoT, ToT, ReAct)
- ▶ Systematic prompt testing and evaluation
- ▶ Building reusable prompt libraries
- ▶ Understanding model limitations and behaviors
- ▶ Creating few-shot examples
- ▶ Adversarial testing (red-teaming)

When Needed:

- ▶ Complex multi-step reasoning tasks
- ▶ High-stakes applications (legal, medical)
- ▶ Creative content generation at scale
- ▶ Fine-tuning training data creation

(Ref: OpenAI Career Page , Anthropic Hiring Posts)

Salary Range:

- ▶ India: Rs15-40 LPA
- ▶ US: \$175K-\$335K

Fun Fact: OpenAI job posting : "Prompt Engineer, \$300K+" went viral. Shows market value of this skill.

Reality: Will likely merge into AI Engineer role long-term, but hot specialty in today's time.

Career Note: Often a specialization within AI Engineer role, but some companies hire dedicated prompt engineers.



The Modern Data Scientist: How the Role Changed

Old Focus (Pre-2022):

- ▶ Building ML models from scratch
- ▶ Feature engineering
- ▶ Hyperparameter tuning
- ▶ Model selection (RF vs XGBoost vs DL)
- ▶ Deployment (90% never deployed)

Reality Check: Most traditional DS projects failed. Models sat unused. ROI unclear.

New Focus (2024+):

- ▶ **Data Curation** for fine-tuning LLMs
- ▶ Creating evaluation datasets
- ▶ Prompt engineering at scale
- ▶ Small-model optimization (distillation)
- ▶ Hallucination detection
- ▶ RAG system design

New Reality: "Data is the new source code." Quality datasets matter more than model architecture.

Truth Bomb: Many "Data Scientists" are now doing prompt engineering + RAG. Job titles lag reality.



AI Safety & Alignment Engineer (Emerging Field)

Ensure AI systems are safe, aligned with human values

Core Focus Areas:

- ▶ Preventing hallucinations and misinformation
- ▶ Detecting and mitigating bias
- ▶ Red-teaming AI systems (adversarial testing)
- ▶ Developing safety evaluation frameworks
- ▶ Preventing jailbreaks and prompt injections

Key Techniques:

- ▶ RLHF (Reinforcement Learning from Human Feedback)
- ▶ DPO (Direct Preference Optimization)

(Ref: Anthropic Research Blog, OpenAI Alignment Updates 2024)

Who's Hiring:

- ▶ Anthropic (leading in this space)
- ▶ OpenAI (Alignment team)
- ▶ Google DeepMind
- ▶ Meta (Responsible AI)

Requirements:

- ▶ Strong ML background
- ▶ Research experience (often PhD)
- ▶ Understanding of AI ethics
- ▶ High competition for roles

Salary Range:

- ▶ US: \$200K-\$350K+ (top labs)



AI Career Paths: Quick Comparison

Role	Primary Skills	Coding Level	Entry Barrier	Demand
AI Engineer	Python, APIs, RAG, LLM orchestration	Medium-High	Medium	Very High
Prompt Engineer	Linguistics, Logic, Testing	Low-Medium	Low	High
Data Scientist	Stats, Python, Data curation	Medium-High	Medium-High	Medium
LLM Ops	DevOps, Monitoring, Optimization	High	High	High
AI Product Manager	Product + AI understanding	Low	Medium	Very High
AI Safety Engineer	ML Research, Ethics	High	Very High	Medium
Data Engineer	Databases, ETL, Infra	High	High	High

(Ref: LinkedIn Jobs Analysis, Levels.fyi 2024)

What are Skills Needed?

- ▶ Problem Solving
- ▶ Statistics Mathematics
- ▶ Programming
- ▶ Data bases/storages
- ▶ Business

Finding Your Persona . . .

Choosing Your Persona for Transition to Data Science



The USER Persona

Who You Are: Domain expert who wants to use AI, not build it from scratch.

Modern Tools (2024):

- ▶ **No-code AI Builders:** Zapier AI Actions, Make.com, n8n
- ▶ **AI Analytics:** Julius AI, Rows, Formula Bot, DataChat
- ▶ **Decision Intelligence:** Dataiku, Alteryx AI
- ▶ **Document AI:** ChatPDF, Claude + PDF upload, NotebookLM
- ▶ **Workflow Automation:** ChatGPT + Custom GPTs, Claude Projects

What You Can Build:

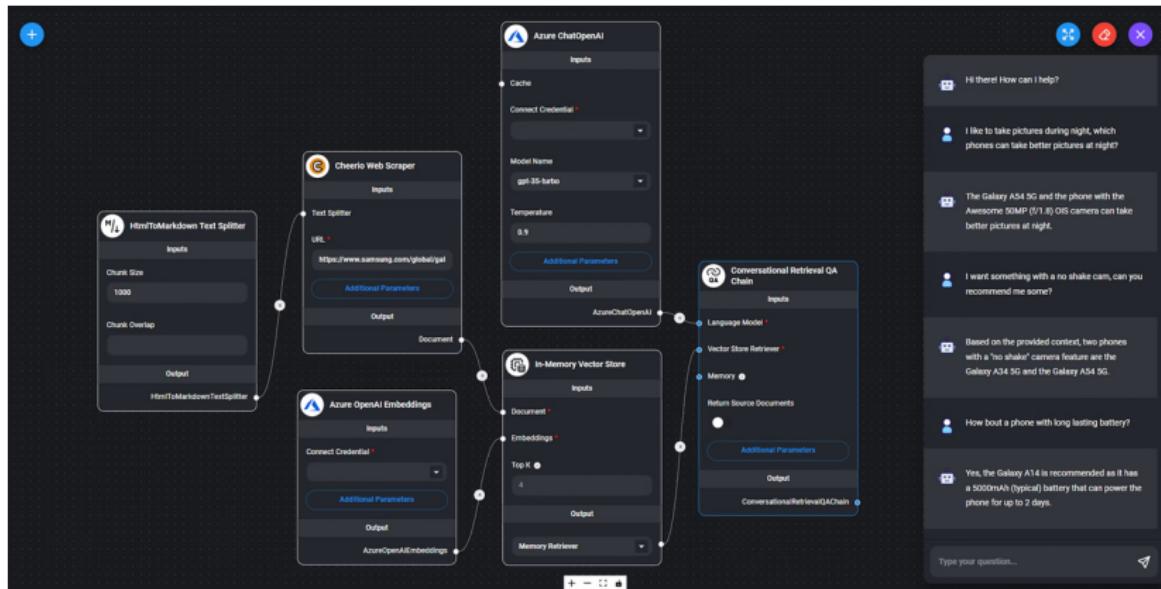
- ▶ Automated email responses (Gmail + ChatGPT)
- ▶ Data analysis workflows (Julius AI)
- ▶ Customer support bots (Zapier + Claude API)
- ▶ Content generation pipelines (Make.com + GPT-4)

Reality: You don't need to code to leverage AI. Start here if you're non-technical or want fastest ROI.

(Ref: Zapier AI Platform, No-Code AI Tools Landscape)



Low Code No Code Platform



(Ref: FlowiseAI)

The DEVELOPER Persona

Who You Are: Technical professional who wants to build AI applications with code.

Modern Stack :

- ▶ **LLM APIs:** OpenAI, Anthropic, Google Gemini
- ▶ **Orchestration:** LangChain, LlamaIndex, Haystack, Semantic Kernel
- ▶ **Vector DBs:** Pinecone, Weaviate, Qdrant, Chroma
- ▶ **Frameworks:** Streamlit, Gradio, Chainlit (UI)
- ▶ **Monitoring:** LangSmith, Helicone, Arize
- ▶ **Deployment:** Vercel AI SDK, Modal, Replicate

What You'll Build:

- ▶ RAG applications (Chat with your data)
- ▶ AI agents (autonomous task execution)
- ▶ Custom chatbots with tool calling
- ▶ Multi-modal applications



The DEVELOPER Persona

Key Shift from 2020:

- Less: scikit-learn, TensorFlow
- More: API calls, RAG, Agents

Reality: "80% of your code is API orchestration, 20% is model work"

Time Investment:

- 3-6 months to job-ready
- Need portfolio of deployed apps



The RESEARCHER Persona

- ▶ Passionate about mathematics and innovation.
- ▶ Invent new techniques, contribute to research.
- ▶ Caters to deep R&D professionals, PhD holders.
- ▶ Shape the data science landscape with created libraries.
- ▶ Be at the forefront of groundbreaking discoveries.



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Choosing a Persona

- ▶ Select a persona based on skills and interests.
- ▶ Allow projects and interests to guide your journey.
- ▶ Explore new areas of expertise.
- ▶ Expand your skill set accordingly.
- ▶ The right persona empowers excellence and lasting impact.



Career in AI: But . . . , But . . . , How to prepare?



What got you here, won't get you there!!
- Marshal Goldsmith



So, Well, you can't prepare!!
not everything, but certainly, specifically ...



Are you suitable?

Advantages:

- ▶ Domain Expertise
- ▶ Maturity, Communication, Soft Skills
- ▶ Problem Solving

Dis-advantages:

- ▶ Lost touch with Mathematics
- ▶ Un-Learning and Re-Learning inertia
- ▶ Starting from scratch? Seniority?



Why do you want to Switch?

- ▶ $\$_1 \$_2 \$_3 \dots \$_n$?
- ▶ Will remain in fashion forever?
- ▶ Hate my current job? no growth?



What's in it for me?

Current + ML combo?

- ▶ First : DON'T QUIT!!!
- ▶ Don't lose advantage due to domain expertise
- ▶ ML just another problem solving technique, IF DATA IS AVAILABLE
- ▶ Can you leverage domain expertise and apply ML there, a good/smooth transition?



More Generally . . . For Career . . .



Ikigai



(Source: How To Find Your Ikigai And Transform Your Outlook On Life And Business - Chris Myers)

Generic Gyan

Specific Knowledge

- ▶ Unique, rare combination
- ▶ Un-trainable, un-scalable
- ▶ Acquired through apprenticeship

Leverage

- ▶ Permission-ed: Capital, Labor
- ▶ Un-permission-ed: Content, code
- ▶ Marginal cost of duplication

Wealth is a positive sum game

Foreword by
TIM FERRISS

THE ALMANACK OF NAVAL RAVIKANT

A guide to wealth and happiness
ERIC JORGENSEN

Own story

- ▶ Current jobs were not available 10 yrs back
- ▶ Pick difficult problems/domain, Job, RnD
- ▶ If not now, can change later, Mid career change, harder, but possible.



Career in AI: Tools



Scikit-Learn



- ▶ Popular machine learning library
- ▶ Provides simple and efficient tools for data mining and data analysis

TensorFlow



TensorFlow

- ▶ TensorFlow is an open-source library for machine learning and artificial intelligence
- ▶ Developed by the Google Brain team
- ▶ Allows easy deployment of computation to CPUs, GPUs, and TPUs
- ▶ Provides a Python API as well as APIs for other languages

Key Features

- ▶ Eager Execution for interactive coding
- ▶ Keras for building and training models
- ▶ TensorFlow Hub for reusable models
- ▶ TensorFlow Lite for mobile and embedded devices
- ▶ TensorFlow Extended (TFX) for model pipelines

Code Example: MNIST Digits Classification

```
import tensorflow as tf

mnist = tf.keras.datasets.mnist
(x_train, y_train), (x_test, y_test) = mnist.load_data()

model = tf.keras.models.Sequential([
    tf.keras.layers.Flatten(input_shape=(28, 28)),
    tf.keras.layers.Dense(128, activation='relu'),
    tf.keras.layers.Dropout(0.2),
    tf.keras.layers.Dense(10, activation='softmax')
])

model.compile(optimizer='adam', loss='sparse_categorical_crossentropy',
model.fit(x_train, y_train, epochs=5)
model.evaluate(x_test, y_test)
```

Future Developments

- ▶ Improved support for multi-cloud and hybrid environments
- ▶ Continued focus on performance, scalability, and efficiency
- ▶ Integration with emerging hardware like AI accelerators
- ▶ Expanded model libraries and pre-trained models
- ▶ Advanced features for research and experimentation

Pytorch



- ▶ Open-source machine learning library
- ▶ Developed by Facebook's AI Research lab (FAIR)

ChatGPT - A Tipping Point for Generative AI

- ▶ Released by OpenAI in November 2022
- ▶ Generative AI chatbot
- ▶ Rapid worldwide popularity
- ▶ 1 million users in 5 days
- ▶ Netflix took 3.5 years for same user count
- ▶ 100 million monthly active users by January 2023
- ▶ Fastest-growing application in history

Midjourney: Image Generation Model

- ▶ Developed by Midjourney Inc.
- ▶ Released in July 2022
- ▶ Architecture details undisclosed
- ▶ High-quality image generation
- ▶ Wide variety of styles and genres

LLaMA

- ▶ February 2023: Meta releases LLM "LLaMA"
- ▶ LLaMA: 65-billion parameter model
- ▶ Trained on extensive text and code dataset

Significance of LLaMA Release

- ▶ One of the largest public LLMs
- ▶ Suited for complex and challenging tasks
- ▶ Open source, initially for research purposes
- ▶ Model weights leaked online, accessible to all
- ▶ Sparked development of numerous open source LLMs

Anthropic Claude

The screenshot shows a user interface for generating product names. At the top, there's a header with a back arrow, 'Intro', 'Roles', 'Mid', 'Tools', and a search bar. Below the header, the title 'Fit Shaker: Fast and Healthy' is displayed, along with 'Chat' and 'Edit Chat' buttons. A light blue sidebar contains the text: 'Product names: HomeShaker, Fit Shaker, QuickShake, Shake Maker', 'Product description: A pair of shoes that can fit any foot size.', 'Seed words: adaptable, fit, omni-fit', and 'Product names:'. To the right of this sidebar is a small circular icon with a white letter 'M'. Below the sidebar, a gray box contains the text: 'Here are some suggested product names based on the seed words:' followed by a bulleted list: '• OmniFit', '• AdaptiShoe', '• UniSole', '• One Size Fits All', and '• FlexiFit'. At the bottom left is a text input field with placeholder text 'Write a message...', and at the bottom right is a blue send button with a white right-pointing arrow.

(Ref: The Complete Prompt Engineering for AI Bootcamp (2023))

Created by Anthropic
<https://console.anthropic.com/>
or API Uses Constitutional AI rather than RLHF
Constitutional AI trains to follow a set of high-level principles or rules, such as a constitution, that specify the desired behavior and outcomes of the system. RLHF uses human feedback, such as ratings, preferences, or corrections, to optimize a language model or an agent's policy using reinforcement learning

Github Copilot: Breakthrough Coding Assistant

- ▶ OpenAI introduced Github Copilot in 2021
- ▶ Built on GPT-3 architecture
- ▶ Fine-tuned on millions of public code lines
- ▶ Auto-completes and suggests code
- ▶ Supports multiple programming languages

The Modern AI Stack (2024+)

Models (The Brains)

- ▶ Proprietary: GPT-4o, Claude 3.5, Sonnet, Gemini 1.5 Pro
- ▶ Open Weights: Llama 3.1, Mistral, Qwen

Orchestration (The Glue)

- ▶ LangChain
- ▶ Llamaindex

Memory (The Context)

- ▶ Vector DBs: Pinecone, Chroma, Weaviate

Hubs (The Repository)

- ▶ Hugging Face: The "GitHub of AI". Essential for datasets and open-source models.

RAG: Retrieval Augmented Generation

How to stop AI from hallucinating and know your private data.

1. **Retrieval:** User asks a question → System searches your company PDFs/SQL.
2. **Augmentation:** System pastes relevant info into the Prompt.
3. **Generation:** LLM answers the question using *only* that info.



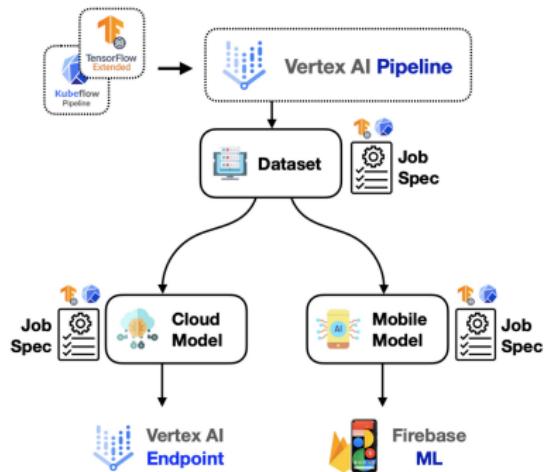
Coding Assistants

Writing code from scratch is obsolete.

- ▶ **Cursor / Windsurf:** AI-native code editors.
- ▶ **GitHub Copilot:** Autocomplete for logic.
- ▶ **Claude 3.5 Sonnet (Artifacts):** Generate full UIs and visualizations in seconds.



Cloud Platforms: GCP



- ▶ Google Cloud Platform (GCP)
- ▶ Cloud computing services by Google
- ▶ Offers various AI and machine learning services such as Gen AI Studio, Vertex AI, etc.

Cloud Platforms; Azure



- ▶ Microsoft Azure
- ▶ Cloud computing services by Microsoft
- ▶ Provides AI and machine learning services like Azure Machine Learning, Cognitive Services, etc.

Cloud Platforms: AWS



- ▶ Amazon Web Services (AWS)
- ▶ Cloud computing services by Amazon
- ▶ Offers AI and machine learning services such as Amazon SageMaker, Amazon Comprehend, etc.

Learning Path, Roadmap



Resources

- ▶ First : try Free Online resources, see how much you grasp
- ▶ No expensive (read, fees in lakhs) certification courses, to start with
- ▶ Test waters, gain some understanding of yourself then decide.

Analytics Vidhya Learning Path 2017

- ▶ An year long schedule
- ▶ Mostly free resources
- ▶ Followed it myself
- ▶ Separate paths for:
 - ▶ Beginner: Not much experience in programming but just college maths
 - ▶ Transitioner: Decent experience programming, but no ML and just college maths
 - ▶ Intermediate: Knows ML, comfortable with programming and maths.

<https://www.analyticsvidhya.com/blog/2017/01/the-most-comprehensive-data-science-learning-plan-for-2017/>



Start Playing the Role

- ▶ Wish to be a Data Scientist? Start playing that role today.
- ▶ Take specific actions to embody the desired role.
- ▶ Tone of the suggestion: Begin playing the coveted role immediately.

Build Foundation

- ▶ Take courses in necessary mathematics, programming, ML, and DL.
- ▶ Engage in assignments to solidify foundational knowledge.
- ▶ Lay the groundwork for a strong understanding of key concepts.

Kaggle Competitions

- ▶ Participate in Kaggle competitions across various domains.
- ▶ Explore NLP, Image Processing, Time-Series, and more.
- ▶ Gain practical experience and exposure to diverse challenges.

Specialize and Apply

- ▶ Choose a specific area, e.g., NLP, and go deep into it.
- ▶ Apply your expertise to problems from different domains (legal, medical, etc.).
- ▶ Develop a comprehensive and specialized skill set.

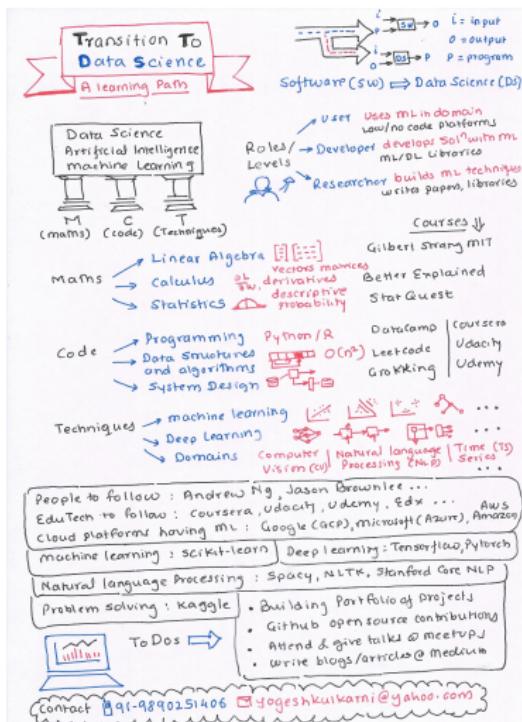


Build a GitHub Portfolio

- ▶ Showcase your work, courses, and projects on GitHub.
- ▶ Portfolio serves as a self-assessment tool and demonstrates your grasp.
- ▶ Discuss it during interviews, providing concrete evidence of your skills.
- ▶ Your GitHub repo is your real resume – proxies like education and gender matter less.



My Sketchnote



(Ref: How to become a Data Scientist? - Yogesh Kulkarni)

Summary Steps

Prep:

- ▶ Mathematics: Statistics, Calculus, Linear Algebra
- ▶ Programming: Python, Data Structure & Algorithms, Tools
- ▶ ML/DL: algorithms & frameworks
- ▶ Practice: Kaggle, Hackathons, projects on Github, blogs, Meetups-talks, etc.



Pune AI Community

Refer: Pune-AI-Community GitHub repo for an year long plan for ramping-up on AI.



Career in AI: References

References

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- ▶ Learning Plan 2017 for beginners in data science - Analytics Vidhya
- ▶ Mid-Career Transitions into ML-AI, with Yogesh Kulkarni - Choose To Thinq <https://www.youtube.com/watch?v=IQzWosVzkM4>
- ▶ What is Data Science? - SimpliLearn
- ▶ Roadmap: How to Learn Machine Learning in 6 Months - Zach Miller, Senior Data Scientist at Metis
- ▶ Tetiana Ivanova: How to become a Data Scientist in 6 months
- ▶ How to switch career to data science from non computer science background - Codebasics
- ▶ Step by step roadmap for machine learning engineer - Codebasics

Thanks ...

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