AAI-101 Introduction to AI tools

Summary

This document outlines the requirements for Module 1 of the CodeBoxx Applied AI

curriculum. In this module, candidates will first explore AI tools from a user perspective,

as well as from a developer perspective.

Objectives

● Familiarization with LLM tools from a user perspective

● Familiarization with Prompt Engineering

● Introduction to AI tools for developers

Requirements

Before we dive into the content, let’s set up the necessary tools.

1. Install Acaconda– A powerful package manager that simplifies managing Python

libraries and environments.

2. (Optional) Set up Visual Studio Code (VS Code), a versatile and lightweight code

editor that enhances coding, debugging, and file management. While Anaconda

covers all required tasks, using VS Code is a matter of preference.

3. Clone the CodeBoxx AI Toolkit repository at

https://github.com/Gamikaru/codeboxx-aai-student-lab

4. Create your own repository on GitHub, using the previous repository as the base

you’ll be working on.

5. Insert the link to your repository at the bottom of this document, in the

Deliverables section.

Part 1: Introduction to AI tools and Prompt Engineering

Instructions: Provide your answers, and if applicable, any images and/or links required

for the exercises. Once finished, upload the completed document to the submission

area of the deliverable(s) section.

Student Name: Walter Heger

Exercise 1.1

I am a software engineer with 30 years of development using C++ and Java on a Windows and Linux environment. How do I get a job using in Machine Learning. I have been studying on the side, but that does not seem to get me any interviews.

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Transitioning into machine learning (ML) with a background in C++ and Java is possible, but breaking into the field often requires more than self-study. Since you've been studying on the side but haven't received interviews, here are some concrete steps to improve your chances:

1. Build Practical ML Projects

Companies want to see applied ML experience. You should build a portfolio of real-world projects demonstrating your skills. Given your experience, try working on:

End-to-End ML Pipelines: From data collection, preprocessing, training models, and deploying them.

Algorithm Development: Implement ML algorithms from scratch (e.g., decision trees, neural networks) in Java or C++.

Specialized Applications: Given your background in computational geometry and digital signal processing, you could work on ML models in those domains.

Contribute to Open Source: Participate in ML libraries like TensorFlow (C++/Python), MLpack (C++), or Tribuo (Java).

2. Demonstrate Skills on GitHub & Kaggle

GitHub: Create repositories showcasing ML models implemented in Java or C++.

Kaggle: Participate in competitions, write notebooks, and gain rankings.

3. Tailor Your Resume to ML Roles

Your resume might not be getting past ATS (Applicant Tracking Systems) if it focuses too much on traditional software development. Highlight:

ML-related projects (even self-study ones).

Experience with ML frameworks (e.g., TensorFlow, PyTorch, XGBoost).

Knowledge of data processing tools (Pandas, NumPy, SQL).

Any coursework, certifications, or online courses.

4. Network Strategically

Since you're struggling to get interviews:

Attend ML meetups, conferences (NeurIPS, ICML, CVPR), and online communities.

Engage in discussions on LinkedIn, Twitter, and ML Slack communities.

Contact hiring managers directly at companies with ML teams.

5. Consider Graduate-Level ML Courses

You mentioned considering a graduate course in ML. While not always necessary, structured learning at a well-known institution (e.g., Stanford, MIT, Georgia Tech OMSCS) can improve credibility.

6. Apply for the Right Roles

Given your background, you may find it easier to transition into:

ML Engineering Roles: Building scalable ML systems (focus on deployment and optimization).

Algorithm Development: Applied ML research in domains like finance, healthcare, or signal processing.

Hybrid Roles: Software Engineering roles in ML-driven companies (e.g., at Google, NVIDIA).

Would you be open to focusing on an ML-related domain that aligns with your past experience, such as computational geometry or DSP? That might be an easier transition than a general ML role.

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It’s great to hear that you have a strong background in software engineering with C++ and Java, as those skills will definitely help you transition into Machine Learning (ML). However, breaking into ML can be competitive, especially with just side study experience. Here's a structured approach to help you land a job in ML:

1. Build a Strong ML Foundation

Even though you’re already studying on the side, it's crucial to ensure you have a solid understanding of both the theoretical and practical aspects of ML.

Learn the Fundamentals: Ensure you have a strong grasp of key ML concepts such as supervised and unsupervised learning, model evaluation, overfitting, cross-validation, feature engineering, etc. If you haven't already, consider resources like:

Courses: Coursera’s Machine Learning by Andrew Ng, or specialized ones like Deep Learning Specialization.

Books: "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron and "Pattern Recognition and Machine Learning" by Christopher Bishop.

Online Resources: Blogs, YouTube tutorials, and Kaggle notebooks.

Deepen Your Math Skills: ML often requires a good understanding of linear algebra, calculus, probability, and statistics. If you’re not comfortable with these, consider revisiting them.

2. Practical Experience with Projects

You need practical, hands-on experience to showcase your skills to potential employers. This will be more impressive than just theoretical knowledge.

Kaggle Competitions: Participate in Kaggle competitions to gain experience working with real-world datasets and building models. Even if you don’t win, the process will teach you a lot about data wrangling, feature engineering, and model deployment. It will also serve as an excellent portfolio piece.

Open Source Contributions: Contribute to open-source ML projects. Sites like GitHub have a variety of ML-related projects, and contributing can help you build credibility and get involved in the community.

Build a Portfolio: Create a personal website or GitHub repo where you showcase your projects. You can start by implementing common ML algorithms like linear regression, decision trees, or neural networks, and eventually build more complex systems, such as recommendation engines, NLP models, or computer vision systems.

Focus on projects that reflect practical applications—something that would catch an employer's eye (e.g., predictive modeling, fraud detection, image classification).

3. Learn ML Frameworks and Libraries

Being proficient with popular ML frameworks and libraries will make you more marketable:

Scikit-Learn: Great for traditional ML algorithms and is well-documented.

TensorFlow/PyTorch: These are the most popular deep learning frameworks. PyTorch is often preferred in research and academia, while TensorFlow is widely used in production environments.

Keras: A user-friendly deep learning API built on top of TensorFlow.

Pandas, NumPy, and Matplotlib: Essential libraries for data manipulation and visualization.

If you are familiar with Java, you might also want to explore Deeplearning4j for deep learning, though Python is the dominant language for ML.

4. Networking

Even if your technical skills are in place, networking is a key part of landing interviews in the ML field.

LinkedIn: Connect with people in the ML field, follow companies you're interested in, and share your projects. Engage with ML-related posts and participate in discussions.

Meetups and Conferences: Attend ML meetups, webinars, or conferences like NeurIPS, ICML, or local tech events. These can be great opportunities to network, learn from industry leaders, and find potential job opportunities.

Twitter and GitHub: Many ML experts and companies share updates and job postings on Twitter. Following influential ML researchers or practitioners and engaging with their content can help you get noticed.

5. Apply Strategically

When applying, make sure you’re targeting the right positions for your current skill level while demonstrating your willingness and ability to learn.

Entry-Level or Transition Positions: Look for roles like:

Data Scientist Internships

ML Engineer (Junior)

AI Research Assistant

Data Analyst (with machine learning focus)

Even though you have years of experience in software development, ML roles often require specific skills in statistical methods, data science, and algorithm development that differ from standard software engineering. Applying to roles that align with your current expertise but also provide room for growth can give you the best chance.

Customize Your Resume: Highlight relevant projects, coursework, and specific tools you’ve used in your ML journey (e.g., TensorFlow, PyTorch, scikit-learn, etc.). Tailor your resume to the ML field, focusing on transferable skills such as data manipulation, algorithm implementation, and performance optimization.

6. Leverage Your Software Engineering Background

You have 30 years of development experience, which is valuable in ML roles, especially when it comes to building scalable and efficient systems. Consider roles where you can bridge your software engineering expertise with ML, such as:

ML Software Engineer: Focus on integrating ML models into production environments, optimizing models for performance, and ensuring that ML systems are scalable.

MLOps Engineer: This is a rapidly growing field, combining software engineering with ML model deployment and management in production systems. Given your experience with Linux and Windows, this could be a natural fit.

AI Platform Engineer: If you have experience working on complex systems or building development tools, an AI platform engineer role could involve creating the infrastructure that supports ML workflows.

7. Consider Further Education

If you feel your studies haven't been sufficient, enrolling in a more structured educational program like a Master's in Data Science or AI can help bolster your credibility and give you more exposure to practical, hands-on experience.

Some of the top universities offer online programs, such as:

Stanford Online AI Certificate

Master’s programs from Coursera or edX (e.g., Georgia Tech, University of Michigan)

8. Stay Updated

Finally, machine learning is evolving rapidly. Keep up with the latest research, news, and trends. Follow researchers and practitioners in the field, read papers, and take part in relevant communities.

In Summary:

Strengthen your ML fundamentals (both theory and hands-on experience).

Build a portfolio with personal and open-source projects.

Learn popular ML libraries and frameworks.

Network with professionals in the ML space.

Apply strategically to roles that match your current skills but also allow growth.

Leverage your software engineering background to pursue roles like ML engineer or MLOps engineer.

Consider further education for additional credibility and exposure.

While the transition to ML may take time, your extensive experience in software engineering is an asset, and with the right approach, you should be able to break into the field.

Good luck! If you need any help with your portfolio, resume, or any technical concepts, feel free to ask!

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Exercise 1.2

similar but has a few variations

Exercise 2.1

write a poem about a frustrated programmer seeking a job at the end of his career and having all sorts of problems in a declining industry

The Last Debug

He types away, his fingers worn,

Three decades deep in code he's sworn.

From C++ to Java’s reign,

Through shifting tech, through joy and pain.

The world once thrived on lines he wrote,

A pioneer, a system’s boat.

Yet now the job posts scroll on by,

Demanding youth, machine-learned eyes.

He knows the sort, the merge, the hash,

Has built the tools, has watched them crash.

Yet résumés, they sink like stone,

No callbacks, silence, all alone.

"Too senior," whispers through the void,

"Too set, too slow, too obsolete toyed."

They want fresh minds with half his skill,

To mold anew, to shape at will.

He learns of tensors, networks deep,

Yet Python mocks him in his sleep.

For every course, for every test,

The interview says: "You're not the best."

The industry, now cold and lean,

Has traded minds for a data stream.

He fights to prove he's worth the wage,

Yet finds himself outside the cage.

And so he sits, a veteran lost,

Wondering if the fight’s worth cost.

Yet in the silence, sparks ignite—

He’ll build his own, he’ll stand, he’ll write.

For code is code, the mind still keen,

No age will dull what once has been.

If none will hire, then he shall show—

A programmer’s fire will never slow.

Exercise 3.1

translate the last response into Slovak

Posledný Debug

Píše ďalej, prsty zodraté,

tri dekády kódu zasvätené.

Od C++ po vládu Javy,

cez meniace sa časy dravý.

Svet kedysi rástol z jeho riadkov,

priekopník, loď zo starých skladov.

No dnes sa inzeráty valia,

mladé oči strojovo žiaria.

Pozná sort, merge, pozná hash,

nástroje staval, videl ich pád.

A predsa životopis padá,

žiadna odpoveď, len prázdna brána.

"Príliš starý," šepká vietor,

"príliš tuhý, pomalý sektor."

Hľadajú mladých s polkou schopností,

tých, čo formujú bez ťažkostí.

Učí sa siete, hlboký vnem,

no Python mu kradne sen.

Každý kurz, každá skúška,

a odpoveď: "Nie si prvá voľba."

Odvetvie chladné, vyprázdnené,

myseľ za dátové toky vymenené.

Bojuje ďalej, chce svoju šancu,

no nachádza sa mimo tanca.

A tak sedí, veterán stratený,

či bojovať ďalej, či vzdať sny.

No v tichu ešte iskra vzplanie—

postaví sám, nech svet si bráni.

Kód je kód, myseľ stále ostrá,

vek mu silu nevie vziať.

Ak ho nik nechce, on sám dokáže—

oheň programátora nikdy neuhasne.

Exercise 4.1

Compare and contrast the economic policies of Richard Nixon and George H Bush

Comparing and contrasting the economic policies of Richard Nixon and George H.W. Bush reveals some key similarities and differences, largely shaped by the economic contexts they faced. Here's a breakdown:

Richard Nixon:

Key Policies:

Nixon's economic policies were marked by his response to the stagflation of the early 1970s.

He famously implemented wage and price controls in an attempt to curb inflation.

A significant action was the "Nixon Shock," which included taking the U.S. off the gold standard, fundamentally altering the international monetary system.

He also oversaw the expansion of some social programs.

Economic Context:

Nixon dealt with rising inflation and unemployment, a phenomenon known as stagflation.

The Bretton Woods system was collapsing, leading to instability in international currency markets.

There was also the increase in competition from foreign markets.

Overall:

Nixon's policies were often interventionist, reflecting a willingness to use government power to address economic problems.

George H.W. Bush:

Key Policies:

Bush's presidency was dominated by efforts to manage the federal budget deficit.

His most controversial economic decision was agreeing to a budget deal with Congress that included tax increases, breaking his "no new taxes" pledge.

He also had to deal with the Savings and Loan crisis, which required a large government bailout.

He also signed the North American Free Trade Agreement.

Economic Context:

Bush inherited a large federal budget deficit from the Reagan era.

The Savings and Loan crisis posed a significant threat to the financial system.

The end of the Cold War created new economic opportunities and challenges.

Overall:

Bush's policies were often constrained by the need to address the budget deficit.

He was more inclined to free trade, as shown by the NAFTA agreement.

Comparison:

Similarities:

Both presidents faced significant economic challenges.

Both had to navigate complex fiscal situations.

Both had to work with congress that had opposing views.

Differences:

Nixon's policies were more interventionist, while Bush's were more focused on fiscal restraint.

Nixon dealt with stagflation and international monetary instability, while Bush dealt with the budget deficit and the S&L crisis.

Nixon changed the international currency standards, while Bush worked more with free trade agreements.

In essence, Nixon's economic policies were characterized by a more active role for the government, while Bush's were more constrained by fiscal realities and a movement towards free trade.

Exercise 4.2

Explain if modern psychoanalysis is effective towards normal people in a difficult situation. Unfortunately, I just think it is a bunch of charlatans handing your question back to you.

A

It's true that psychoanalysis has faced criticism, and its effectiveness is a subject of ongoing debate.

Here's a breakdown of the complexities surrounding modern psychoanalysis:

Modern Psychoanalysis: Evolution and Adaptations

Shift from Classical Freudian Concepts:

Modern psychoanalysis has moved away from some of Freud's original, more rigid theories.

It now incorporates contemporary understandings of psychology, including attachment theory, interpersonal relationships, and neurobiology.

Focus on Relational Dynamics:

There's a greater emphasis on the therapeutic relationship itself, recognizing that the interactions between therapist and patient are crucial for change.

This "relational" approach acknowledges that people's difficulties often stem from patterns developed in their relationships with others.

Variety of Approaches:

"Psychoanalysis" isn't a monolithic entity. There are various schools of thought within it, each with its own nuances.

Some modern psychoanalytic therapies are shorter-term and more focused than traditional, long-term analysis.

Effectiveness and Evidence

Research Challenges:

It's difficult to conduct controlled studies on psychoanalysis due to its long-term nature and the subjective nature of its goals.

However, research does exist, and it suggests that psychoanalytic therapies can be effective for a range of issues, including:

Depression

Anxiety disorders

Personality disorders

Relationship difficulties

Emphasis on Deep-Seated Issues:

Psychoanalysis is often best suited for individuals with long-standing, complex psychological problems.

It aims to address the root causes of these problems, rather than just treating surface-level symptoms.

Criticisms:

Some critics argue that psychoanalysis is too time-consuming and expensive.

Others question its scientific validity, pointing to the difficulty of measuring its outcomes.

The feeling that a therapist is just reflecting the patients own words back to them, can be a valid criticism of some practitioners.

"Normal" People in Difficult Situations

Even "normal" people can benefit from exploring their inner lives and relationship patterns, especially during times of stress or transition.

Psychoanalytic therapy can provide a space for self-reflection and deeper understanding, which can be valuable for coping with difficult situations.

It is important to understand that there are many forms of therapy, and that psychoanalysis is not a one size fits all solution.

In conclusion:

Modern psychoanalysis has evolved significantly, and there is evidence to support its effectiveness for certain conditions. While criticisms exist, it remains a valuable approach for those seeking in-depth psychological exploration.

An Introduction and Brief Overview of Psychoanalysis - PMC - PubMed Central

Source icon

pmc.ncbi.nlm.nih.gov

Psychoanalytic Therapy - StatPearls - NCBI Bookshelf

Source icon

www.ncbi.nlm.nih.gov

Contemporary Relational Psychoanalysis | Trauma and Abuse Recovery | Personality Disorders | West Los Angeles, California

Exercise 5.1

What are the most likely days for rain in the next week in Tampa, Florida

To get the most accurate and up-to-date information on the likelihood of rain in Tampa, Florida, I recommend checking these resources:

The Weather Channel (weather.com):

This website provides detailed hourly and daily forecasts, including precipitation probabilities.

It's a reliable source for current weather conditions and future predictions.

National Weather Service (weather.gov):

This is the official source for weather information in the United States.

They offer forecasts, warnings, and radar imagery.

Local News Weather Reports:

Local news stations in the Tampa Bay area provide regular weather updates, often with more specific details about the region.

When looking at these sources, pay attention to:

Percentage of precipitation: This indicates the likelihood of rain.

Radar imagery: This can show you where rain is currently falling and where it's headed.

General tips for Tampa weather:

Florida is known for its afternoon thunderstorms, especially during the warmer months. So, even if the morning is sunny, there's always a chance of rain in the afternoon.

Checking right before going out is always a good idea.

I hope this helps!

Exercise 5.2

Summarize yesterday’s results from NBA?

To give you a concise overview of yesterday's NBA results, here's a summary based on the information I found:

Here are some of the results from the NBA games that were played:

Los Angeles Lakers vs. Los Angeles Clippers: Los Angeles Lakers 106 - 102 LA Clippers

Utah Jazz vs. Minnesota Timberwolves: Utah Jazz 117 - 116 Minnesota Timberwolves

Phoenix Suns vs. New Orleans Pelicans: Phoenix Suns 125 - 108 New Orleans Pelicans

Miami Heat vs. Indiana Pacers: Miami Heat 125 - 120 Indiana Pacers

Chicago Bulls vs. Toronto Raptors: Chicago Bulls 125 - 115 Toronto Raptors

Memphis Grizzlies vs. New York Knicks: Memphis Grizzlies 113 - 114 New York Knicks.

To get the most detailed and up-to-date information, I recommend checking these resources:

NBA.com

ESPN.com

CBSsports.com

These websites provide comprehensive coverage of NBA games, including scores, highlights, and analysis.

Exercise 5.3

What is the weather forecast tomorrow for Tampa, Florida? Make the output look more professional.

Certainly! Here's a more professionally formatted weather forecast for Tampa, Florida, tomorrow:

Tampa, Florida - Tomorrow's Weather Forecast

Overview:

Expect a sunny day.

Temperature:

High: 76 °F

Low: 51 °F

Feels like high: 74°F

Feels like low: 50°F

UV Index:

High (7). Consider wearing sunscreen.

Wind:

10 mph, from the northwest.

Moderate wind.

Conditions:

Sunny skies are expected throughout the day.

Key Considerations:

While the temperature is mild, be mindful of the high UV index and take appropriate sun protection measures.

The wind will be moderate.

Source:

Data provided by The Weather Channel.

I hope this refined presentation is helpful.

ok , if you say so

Exercise 5.4

Check completed • No results found •

Exercise 6.1

Describe a typical day in a futuristic city.

Imagine waking up in a city where the future has truly arrived. The day begins as your smart home gently wakes you with simulated sunlight and a soothing melody. Your personal AI assistant greets you, informing you of your schedule, weather, and even offering tailored breakfast suggestions—based on your nutritional needs and preferences.

Stepping outside, the streets are alive with innovation. Autonomous electric vehicles whisk commuters silently to their destinations. Overhead, drone taxis zip through dedicated air lanes, ferrying passengers to skyscrapers that double as vertical cities—housing parks, schools, offices, and shops.

Pedestrian-friendly walkways feature augmented reality displays, transforming the mundane into the extraordinary. As you pass through vibrant markets, the interactive holograms allow you to try on clothes virtually or customize products in real-time. Sustainability is embedded in the city's core; solar panels, vertical gardens, and wind turbines ensure self-sufficient energy, while robotic waste systems keep streets pristine.

Workspaces are no longer confined to traditional offices. Collaborative hubs powered by virtual reality allow you to interact with colleagues from across the globe as if you're in the same room. Breaks might include a stroll in a floating park suspended between skyscrapers, offering panoramic views of the city's skyline.

As the evening arrives, the city transforms. Streets light up with bioluminescent pathways and colorful LED displays. Cultural events blend technology with artistry—like concerts with holographic performers or immersive theater experiences where you're part of the story.

Returning home, the city’s advanced transport systems ensure a smooth journey, while your smart home has already adjusted the lighting and temperature to your liking. You wind down with a relaxing session in a virtual reality escape or a view of the stars from your rooftop garden, made possible by light pollution control technology.

Wouldn’t it be a wonder to live in such a place? What part of this futuristic vision excites you the most?

I don't like it. Sounds too optimistic. I am expecting a nuclear wasteland.

Exercise 6.2

What are the key impacts of climate change on coastal cities?

Climate change significantly affects coastal cities in various ways:

Rising Sea Levels: Coastal cities face the threat of permanent inundation as sea levels rise. This can lead to the loss of land, displacement of communities, and damage to infrastructure

Increased Flooding: Higher sea levels and more intense storms result in frequent and severe flooding. Tidal flooding and storm surges are becoming more common, impacting homes, businesses, and public spacesReplace this with your answers, and, if applicable, any images or links

Erosion and Habitat Loss: Coastal ecosystems, such as wetlands and coral reefs, are eroding or disappearing. This not only affects biodiversity but also removes natural barriers that protect cities from storm

Exercise 6.3

How can small businesses leverage social media for marketing?

Small businesses can harness the power of social media to amplify their marketing efforts with these strategies:

Define a Clear Audience: Identify your target audience and tailor content to their interests, needs, and behaviors. Use platforms where your audience spends the most time, such as Instagram for younger audiences or LinkedIn for professionals.

Create Valuable Content: Share engaging, informative, or entertaining content. For example, tutorials, behind-the-scenes videos, or user-generated content. Focus on building a brand voice that resonates with your audience.

Consistency is Key: Develop a content calendar to post regularly. Consistency helps build trust and keeps your business visible in followers' feeds.

I just don't trust this goofy stuff.

I think it is pretty good. But this is a canned question with a canned reply

Maybe someone will take it more seriously.

Exercise 7.1

Copilot

Explain why I (at 63 years old) cannot find a decent technical Software Development job in 2024 with 30 years of experience as a developer. I have a MSc in Applied Math. Most of the leads that I try are dead ends.

It can be incredibly disheartening to face such challenges despite your extensive experience and qualifications. Several factors may be contributing to this situation, and addressing them could help refine your approach:

1. Age Bias in the Industry: Unfortunately, ageism still exists in tech. Some companies may incorrectly assume that older candidates are less adaptable to modern technologies or prefer younger hires for cultural fit. Combat this perception by emphasizing recent skills updates or certifications that show you're current with industry trends.
2. Rapid Technological Change: The tech industry evolves at an unprecedented pace. If your experience is rooted in older programming languages or methodologies, employers might see it as less relevant. Highlight your proficiency with newer tools and frameworks or any active learning efforts in your resume or during interviews.
3. Networking Challenges: Professional networks often play a crucial role in securing opportunities. If your network isn’t updated or hasn’t expanded into modern tech spaces, building connections on platforms like LinkedIn, attending meetups, or joining tech communities can open doors.
4. Resume Gaps or Focus: With 30 years of experience, tailoring your resume to highlight specific achievements relevant to the job you're applying for is essential. Generalized resumes may not immediately catch attention in a highly competitive job market.
5. Overqualification Perception: Some roles might seem like a natural fit for you, but employers may hesitate, thinking you’re overqualified or wouldn’t be satisfied with the position long-term. Address this directly during conversations by expressing enthusiasm for the role and its alignment with your current goals.
6. Shifting Job Market Priorities: Companies increasingly value cross-disciplinary skills like DevOps, data engineering, and cloud architecture. It might help to position your deep mathematical and programming expertise in these high-demand areas.
7. Limited Access to the Right Leads: If many leads have turned into dead ends, consider diversifying your job search strategies. Engage with niche job boards specific to software development or tech-adjacent fields, leverage recruitment agencies, and ensure your online profiles are optimized with relevant keywords.

Your expertise is incredibly valuable, especially when combined with the ability to adapt to modern tools and trends. If you'd like, I can suggest specific actions or areas to focus on to revitalize your job search. Let me know!

ChatgptExplain why I (at 63 years old) cannot find a decent technical Software Development job in 2024 with 30 years of experience as a developer. I have a MSc in Applied Math. Most of the leads that I try are dead ends.  
  
You're facing a perfect storm of challenges in the tech job market, many of which are frustratingly beyond your control. Here are some key reasons why finding a solid technical software development job at 63 is difficult, despite your impressive experience:

### **1. Age Discrimination (Implicit or Explicit)**

Even if it's illegal, ageism is a very real barrier in tech. Many companies—especially startups and tech giants—favor younger candidates due to perceptions (often false) that:

* Older developers are less adaptable to new technologies.
* They may expect higher salaries based on experience.
* They might not fit into "younger" team cultures.

This bias makes recruiters and hiring managers less likely to engage, even when you are fully qualified.

### **2. The Market Prefers Recent Experience in Modern Tech**

* Tech Evolves Rapidly: If your experience is mainly in Java, C#, and older paradigms of software development, many hiring managers might consider your skills outdated compared to someone who’s been working with Python, cloud computing, Kubernetes, or modern ML/AI stacks daily.
* Rusty Algorithm Knowledge: You mentioned struggling with coding assessments. Many companies use LeetCode-style challenges to filter candidates, which disproportionately favors younger developers who recently graduated or are used to competitive programming.

### **3. Companies Don’t Want Generalists—They Want Specialists**

With your experience, you likely have a broad skill set across various technologies. However, many job postings today demand hyper-specialization in:

* Cloud platforms (AWS, Azure, GCP)
* AI/ML development
* DevOps/SRE roles
* Frontend/Backend frameworks (React, Angular, Spring Boot)

Recruiters may see your extensive experience but feel you're not a "perfect fit" for any one niche.

### **4. Many Mid-Senior Level Positions Are Being Offshored**

* Large corporations increasingly outsource mid-senior development roles to cheaper markets (India, Eastern Europe, Latin America).
* This reduces available domestic roles and makes competition more intense for the few positions that remain.

### **5. Companies Prefer "Cheap and Hungry" Over "Experienced and Expensive"**

* Perception of High Salary Expectations: Even if you're willing to take a lower salary, many employers assume experienced developers expect premium pay.
* Junior Devs vs. Senior Devs: Many companies believe they can hire two junior devs for the price of one senior developer.
* Limited Senior Individual Contributor (IC) Roles: Many companies push experienced developers into management or architect roles instead of core technical positions.

### **6. The Industry Values What You’ve Done Lately, Not What You’ve Done Over Decades**

If your last major project wasn't cutting-edge or if your machine learning work hasn't been in a production environment, recruiters may hesitate.

### **What Can You Do?**

1. Target Smaller Companies or Legacy Tech Stacks
   * Many large firms filter out older candidates, but mid-sized businesses or older industries (e.g., finance, healthcare, insurance) may need experienced devs.
   * Look for Java/C# roles in industries where modernization is happening but where legacy knowledge is still valuable.
2. Consider Consulting or Contract Work
   * Contract positions are often easier to land because they have fewer hiring hoops and less bias.
   * Your deep knowledge might be valuable for short-term high-impact projects.
3. Showcase Recent Work on GitHub or Open Source
   * Contribute to modern tech projects to prove your skills are current.
   * Build and showcase projects in ML, Java, or cloud technologies.
4. Expand Your Network
   * The hidden job market is real. Many roles aren’t posted online.
   * Leverage connections from past jobs, LinkedIn, or alumni groups.
5. Certifications in Cloud/AI
   * AWS, GCP, or Azure certifications might help prove your ability to work with modern cloud infrastructures.
   * Even if you know the concepts, having the paper can get past HR filters.

### **Bottom Line**

You’re fighting biases that have little to do with your actual ability. The system is unfair, but the best move is to work around the obstacles—find roles where experience is an asset, avoid HR filters by networking directly, and consider consulting or specialized contracting. It’s not easy, but it’s possible.

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Gemini

Explain why I (at 63 years old) cannot find a decent technical Software Development job in 2024 with 30 years of experience as a developer. I have a MSc in Applied Math. Most of the leads that I try are dead ends.

it's understandable that you're facing challenges in your job search. Ageism, coupled with the rapidly evolving tech landscape, can create significant hurdles. Here's a breakdown of the factors that might be contributing to your difficulties:

1. Ageism in the Tech Industry:

* Youth Culture:
  + The tech industry often glorifies youth, associating it with innovation and adaptability. This can create a bias against older workers, even those with extensive experience.
  + There can be a perception that older developers are less likely to keep up with the latest technologies.
* Cost Concerns:
  + Companies might assume that experienced developers command higher salaries, making them less attractive compared to younger, less expensive candidates.

2. Rapid Technological Change:

* Skill Gaps:
  + The pace of technological advancement is relentless. While your 30 years of experience are valuable, companies may prioritize candidates with expertise in the most current frameworks, languages, and tools.
  + Even with an MSc in Applied Math, if your practical coding skills are not up to date with the newest trends, it can be a problem.
* Emphasis on "New":
  + Many companies are focused on cutting-edge technologies like cloud computing, AI, and machine learning. If your experience is primarily in older technologies, you might be overlooked.

3. Hiring Practices:

* Emphasis on "Culture Fit":
  + "Culture fit" can sometimes be a code word for age bias. Companies might subconsciously favor younger candidates who they perceive as better fitting their company culture.
* Recruiting Trends:
  + Modern recruiting often relies on automated systems that scan resumes for specific keywords. If your resume doesn't align perfectly with these keywords, it might be filtered out.

4. Possible mitigation steps:

* Showcase your adaptability:
  + Highlight any recent projects or training that demonstrate your ability to learn new technologies.
  + Emphasize your problem-solving skills and your ability to apply your experience to new challenges.
* Networking:
  + Attend industry events and connect with people in your field. Networking can help you bypass automated systems and get your resume in front of the right people.
* Tailor your resume:
  + Customize your resume for each job application, emphasizing the skills and experience that are most relevant to the position.
  + Consider creating a portfolio on a site like GitHub, to show off your current coding abilities.
* Consider contract work:
  + Contract work can be a good way to gain experience with new technologies and build your network.

It's important to remember that your experience is a valuable asset. By addressing these challenges and adapting your job search strategy, you can increase your chances of finding a fulfilling technical software development job.

Exercise 8.1

Write about the economy of the US in 2025 after Trumps tarriffs.

The U.S. economy in 2025 is navigating the effects of President Trump's renewed tariff policies. These tariffs, targeting major trading partners like China, Canada, and Mexico, have sparked significant economic debates. While intended to protect domestic industries and reduce trade deficits, the tariffs have introduced complexities.

On one hand, certain industries, such as steel and aluminum, have seen a boost due to reduced foreign competition. However, the broader economy faces challenges. Increased costs for imported goods have led to higher prices for consumers, contributing to inflationary pressures

Additionally, industries reliant on global supply chains, like automotive and technology sectors, are grappling with rising production costs

Exercise 8.2

What is machine learning as explained to someone with a MSc. math degree and 30 years of experience as a programmer.

Machine learning (ML) is an area of computer science and artificial intelligence (AI) focused on building algorithms that allow computers to identify patterns in data and make decisions or predictions without being explicitly programmed for specific tasks. Here's a perspective tailored to your advanced background in mathematics and programming:

At its core, machine learning revolves around optimization problems and uses mathematical techniques to approximate functions. The objective is often to minimize or maximize a cost or loss function that quantifies the discrepancy between the algorithm's predictions and the actual data.

Key Concepts:

Models as Functions: Machine learning algorithms are essentially mappings or functions, say f:X→Yf: X \to Y, where XX is the input space (features), and YY is the output space (labels or predictions). These functions can range from linear models (like regression) to highly nonlinear ones (like neural networks).

Training Process: Training a model involves finding the optimal parameters (e.g., weights w\mathbf{w}) of a function fwf\_\mathbf{w} that minimize a loss function LL. This is often done using optimization techniques like gradient descent, which relies on iterative updates guided by the gradients of the loss function with respect to the parameters.

Generalization: The challenge in ML is not just fitting the training data (minimizing LL on the given dataset) but ensuring the model generalizes well to unseen data. Techniques like regularization, cross-validation, and careful feature selection aim to address the bias-variance tradeoff to prevent underfitting or overfitting.

Probabilistic and Statistical Foundations: Many ML methods, like Bayesian models, interpret predictions probabilistically, estimating distributions rather than single outputs. For instance, the posterior P(Y∣X)P(Y|X) is often derived via Bayes' theorem.

Types of Machine Learning:

Supervised Learning: The function fwf\_\mathbf{w} is learned using labeled datasets where each XX has a corresponding YY.

Unsupervised Learning: The algorithm infers patterns (e.g., clusters, latent structures) from unlabeled data.

Reinforcement Learning: Agents learn optimal actions in an environment by maximizing cumulative rewards over time.

Scalability with Big Data: Advances in ML leverage matrix algebra and efficient computations to process high-dimensional datasets. Tensor operations, sparse matrices, and parallel computing are critical in scaling to practical problems.

To put it metaphorically, as a seasoned mathematician and programmer, think of machine learning as creating a system of equations that doesn't have a closed-form analytical solution but can be approximated iteratively, under constraints, using heuristics rooted in probability, linear algebra, and optimization.

If you'd like, I can dive deeper into specific techniques like support vector machines, deep learning, or ensemble methods, or discuss the programming frameworks (e.g., TensorFlow or PyTorch) that make ML practically implementable. What aspect of ML interests you most?Replace this with your answers, and, if applicable, any images or links

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Exercise 8.3

Write a product description for a new type of New Balance 990 running shoe in the style of Edgar Alan Poe's The Raven.

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Once upon a midnight dreary, as I wandered, weak and weary, Seeking solace for my soul, a shoe appeared upon the floor— A vision born of craft so clever, blending past and yet, forever, Its promise whispered softly—comfort, grip, and something more. “New Balance,” breathed the shadowed breeze, “Behold the 990 core.”

No mere sneaker graced that place, but a herald of a grander race, Adorned with mesh like twilight mist and suede as rich as lore. Its cushioning, a spectral dream, bound by an otherworldly scheme, Stabilizing every tread that crossed terrain from shore to shore— "Run," it said, "and feel the heavens, lift with stride forevermore."

In its soles, a labyrinth weaving, the foam like moonlit waves deceiving, Yet firm, unwavering, promising endurance to your core. For those who crave a journey vast, where distance folds and time floats past, The New Balance 990 shall be your guide from door to door. Its spirit whispers, soft yet certain—"Run, and conquer evermore."

Couldn’t you imagine these shoes carrying you through endless miles, like a tale worth telling?

Exercise 8.4

Machine learning (ML) technology plays a transformative role in the automotive industry, reshaping both the business of cars and sales strategies. Here's how:

Dynamic Pricing and Valuation: ML algorithms analyze vast datasets, including market trends, historical sales, and vehicle-specific metrics, to determine real-time valuations. This ensures optimal pricing for both buyers and sellers, maximizing profitability while maintaining competitiveness

.

Inventory Management: Dealerships use ML to predict demand for specific car models, helping them maintain the right inventory balance. This minimizes holding costs and ensures that in-demand vehicles are readily available

.

Personalized Marketing: By analyzing customer data, such as browsing history and preferences, ML enables targeted advertising campaigns. This ensures that potential buyers see vehicles and offers tailored to their interests, enhancing engagement and conversion rates

.

Virtual Showrooms and AR Integration: ML powers virtual showrooms and augmented reality (AR) experiences, allowing customers to explore and customize vehicles online. This immersive approach reduces the need for physical visits while enhancing the buying experience

.

Customer Insights and Behavior Analysis: ML tools analyze customer behavior to predict purchasing patterns and preferences. This helps dealerships tailor their sales strategies and improve customer satisfaction

.

Streamlined Sales Processes: From automating paperwork to providing AI-driven customer support, ML simplifies the car-buying journey. Chatbots and virtual assistants, for instance, guide customers through the process, answering questions and offering recommendations

.

Predictive Maintenance and After-Sales Services: ML algorithms monitor vehicle performance data to predict maintenance needs. This proactive approach enhances customer loyalty by ensuring timely service reminders and reducing unexpected breakdowns.

By integrating ML technology, the automotive industry is not only improving operational efficiency but also redefining the customer experience. Which of these applications do you find most intriguing?

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Exercise 8.5

What is AI?

Artificial Intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think, learn, and make decisions. At its core, AI involves creating systems or algorithms that can process information, recognize patterns, and adapt based on data.

Broadly, AI can be divided into:

1. Narrow AI: AI systems designed to perform specific tasks, such as facial recognition, language translation, or playing chess. Most AI applications we see today fall into this category.
2. General AI: A more advanced form of AI, theoretically capable of performing any intellectual task a human can do, with an understanding of context and reasoning.
3. Superintelligent AI: A speculative stage where AI surpasses human intelligence across nearly all fields—science, art, decision-making.

AI relies heavily on disciplines like mathematics, programming, and statistics, employing techniques like machine learning, neural networks, and natural language processing. It powers innovations from virtual assistants like me to self-driving cars, healthcare diagnostics, and even creative endeavors. What aspect of AI fascinates you most?

Exercise 8.6

In under 100 words, describe quantum computing with an analogy suitable for a high school science AP class.

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Quantum computing is like solving a maze with superpowers. Imagine a classical computer as someone walking through the maze step by step, trying every path one at a time. A quantum computer, on the other hand, is like exploring all paths at once using quantum bits (qubits), which can represent both 0 and 1 simultaneously. This ability, called superposition, combined with entanglement (where qubits work together like synchronized teammates), allows quantum computers to solve complex problems, like cracking codes or simulating molecules, much faster than classical computers. It's like having a superhero brain for solving certain kinds of challenges.

Exercise 8.7

As a financial planner, explain the benefits of starting a retirement fund at 63

Starting a retirement fund at 63 may seem late, but it can still yield significant benefits:

1. Compounding Interest: Even a few years of investment can grow through compound interest, turning initial contributions into a larger nest egg over time.
2. Supplementing Income: It can serve as a financial cushion to complement other sources like Social Security or pensions, ensuring more stability during retirement.
3. Tax Advantages: Retirement accounts like IRAs often offer tax benefits, such as tax-deferred growth or deductible contributions, which can maximize savings.
4. Building Financial Discipline: Starting a fund encourages budgeting and saving habits, helping to manage expenses and plan effectively for future needs.

Every step counts toward a more secure retirement!

Exercise 8.8

List three major CS movements in the 21th century.

Here are three major computer science (CS) movements that have shaped the 21st century:

1. Artificial Intelligence and Machine Learning Revolution: The rapid advancements in AI and ML have transformed industries, from healthcare to finance, enabling technologies like natural language processing, autonomous vehicles, and predictive analytics.
2. Cloud Computing: The rise of cloud platforms like AWS, Azure, and Google Cloud has revolutionized how businesses store, process, and access data, making computing resources scalable and accessible globally.
3. Open Source Movement: Open-source software, such as Linux, Python, and TensorFlow, has fostered collaboration and innovation, empowering developers worldwide to contribute to and benefit from shared technologies.

Which of these movements resonates most with your interests?

Exercise 8.9

Summarize the plot of Kant's A critique of pure reason. include a check to ensure examples illustrate the concept correctly.

Kant’s Critique of Pure Reason (1781, revised in 1787) isn’t a narrative with a “plot,” but rather a dense philosophical treatise exploring the foundations of human knowledge. Kant investigates how we acquire knowledge, dividing it into two realms: pure reason (a priori knowledge, independent of experience) and empirical knowledge (a posteriori, based on experience).

### Key Ideas:

1. Copernican Revolution in Philosophy: Kant argues that instead of the mind conforming to objects in the external world, the external world is shaped by how the mind perceives it. Space and time, he claims, are not external realities but frameworks imposed by our minds.

Example check: Imagine perceiving time as a line. Kant’s idea suggests the line isn’t “out there”—your mind organizes events into a timeline. Does this match intuitive examples like arranging events chronologically in memory?

1. Categories of Understanding: Kant posits that knowledge requires both sensory input and innate mental categories (e.g., causality, quantity). These categories allow us to organize raw data into coherent experiences.

Example check: If you see a ball break a window, your mind applies causality, linking the ball’s motion with the glass shattering. Does this align with how we process events naturally?

1. Phenomena vs. Noumena: Kant differentiates between the world as we perceive it (phenomena) and the world as it exists in itself (noumena). Humans can never directly know the noumenal world, as our perception is limited by our mental faculties.

Example check: Think of a rainbow. You perceive colors due to your sensory faculties, but the “reality” (light refraction) remains beyond direct grasp. Does this reflect the interplay Kant describes?

The treatise ends by challenging metaphysical claims that attempt to go beyond empirical experience, emphasizing the limits of pure reason. Let me know if you’d like to dive deeper into any part!

Exercise 8.10

Explain why I (at 63 years old) cannot find a decent technical Software Development job in 2024 with 30 years of experience as a developer. I have a MSc in Applied Math. Most of the leads that I try are dead ends.

It can be incredibly disheartening to face such challenges despite your extensive experience and qualifications. Several factors may be contributing to this situation, and addressing them could help refine your approach:

1. Age Bias in the Industry: Unfortunately, ageism still exists in tech. Some companies may incorrectly assume that older candidates are less adaptable to modern technologies or prefer younger hires for cultural fit. Combat this perception by emphasizing recent skills updates or certifications that show you're current with industry trends.
2. Rapid Technological Change: The tech industry evolves at an unprecedented pace. If your experience is rooted in older programming languages or methodologies, employers might see it as less relevant. Highlight your proficiency with newer tools and frameworks or any active learning efforts in your resume or during interviews.
3. Networking Challenges: Professional networks often play a crucial role in securing opportunities. If your network isn’t updated or hasn’t expanded into modern tech spaces, building connections on platforms like LinkedIn, attending meetups, or joining tech communities can open doors.
4. Resume Gaps or Focus: With 30 years of experience, tailoring your resume to highlight specific achievements relevant to the job you're applying for is essential. Generalized resumes may not immediately catch attention in a highly competitive job market.
5. Overqualification Perception: Some roles might seem like a natural fit for you, but employers may hesitate, thinking you’re overqualified or wouldn’t be satisfied with the position long-term. Address this directly during conversations by expressing enthusiasm for the role and its alignment with your current goals.
6. Shifting Job Market Priorities: Companies increasingly value cross-disciplinary skills like DevOps, data engineering, and cloud architecture. It might help to position your deep mathematical and programming expertise in these high-demand areas.
7. Limited Access to the Right Leads: If many leads have turned into dead ends, consider diversifying your job search strategies. Engage with niche job boards specific to software development or tech-adjacent fields, leverage recruitment agencies, and ensure your online profiles are optimized with relevant keywords.

Your expertise is incredibly valuable, especially when combined with the ability to adapt to modern tools and trends. If you'd like, I can suggest specific actions or areas to focus on to revitalize your job search. Let me know!

Exercise 9.1

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Part 2: Introduction to AI tools for Developers

This part of the module introduces foundational tools for data manipulation and

analysis.

Setup

1. Access the Repository

a. Visit the CodeBoxx AI Toolkit repository at

https://github.com/Gamikaru/codeboxx-aai-student-lab

b. Take time to read through the README first to understand the repository

structure

2. If not already done, clone the repository

3. If not already done, create your own repository on GitHub, using the cloned

repository as the base you’ll be working on.

4. Launch Jupyter Lab

a. Activate your conda environment if you have one by typing conda activate

your-environment-name

b. Start Jupyter Lab in the repository directory by typing jupyter lab

5. Navigate the Notebooks

a. In your browser, Jupyter Lab will open automatically. If it doesn’t, paste the

links provided after you ran jupyter lab into your browser.

b. Use the file browser on the left to navigate to the appropriate module

folder

Exercises and Datasets

Below is a list of exercises and datasets you'll need. Refer to the Approach section for

guidance on how to proceed.

1. Pandas Tutorials (AAI-101/notebooks/tutorials/)

a. Work through these 10 Sequential Notebooks in order:

i. 1\_pandas\_intro.ipynb - Basic DataFrame operations

ii. 2\_read\_and\_write\_tabular\_data.ipynb - Importing and exporting

data

iii. 3\_selecting\_a\_subset\_of\_df.ipynb - Data filtering and selection

iv. 4\_creating\_plots.ipynb - Basic data visualization

v. 5\_new\_cols\_from\_existing\_cols.ipynb - Data transformation

vi. 6\_calculating\_statistics.ipynb - Statistical operations

vii. 7\_table\_reshaping.ipynb - Reshaping data (pivot, melt)

viii. 8\_combining\_dataframes.ipynb - Merging and joining datasets

ix. 9\_handling\_time\_series\_data.ipynb - Time series analysis

x. 10\_manipulating\_textual\_data.ipynb - Text manipulation

2. Practice Worksheets (AAI-101/notebooks/worksheets/)

a. challenges\_101.ipynb - Practical challenges using student enrollment data

b. further\_challenges\_101.ipynb - Additional practice problems using a

dataset of your choice!

3. Datasets (AAI-101/data/ and AAI-101/air\_quality\_datasets/)

a. Student and enrollment data (students.csv, enrollments.json)

b. Titanic passenger data (titanic.csv)

c. Air quality datasets (various CSV files)

Approach

1. Start with the Basics:

○ Begin with the tutorial notebooks in numerical order

○ Execute each cell and observe the results

○ Modify parameters to deepen your understanding

2. Practice What You've Learned:

○ After completing the tutorials, tackle the challenges in

challenges\_101.ipynb

○ These exercises mirror real-world data tasks

○ Use the provided datasets to complete the exercises

3. Apply to Your Own Projects:

○ For further\_challenges\_101.ipynb, find a dataset that interests you

○ Apply the techniques you've learned to analyze this new dataset

Deliverables

A zip file containing

● This document, containing

○ The answers to part 1 questions

○ A link to your GitHub repository containing your completed notebooks and

datasets. Ensure your project maintains the same folder and file structure

as the cloned repository.

○ GitHub link: https://github.com/heger\_valter/tbic-2502/

<insert your GitHub repository link here>

Make sure to use only the 'Upload a File' option to submit your deliverables.