

PROBLEM STATEMENTS

1. *"Design a tool that automatically detects bugs, security flaws, or inefficiencies in code and provides instant feedback to developers."*

- **Scans code automatically** while developers are writing it.
 - **Identifies issues** such as:
 - **Bugs** → logical errors, syntax issues, incorrect function calls.
 - **Security flaws** → SQL injection risks, unsafe authentication, buffer overflows, insecure API usage.
 - **Inefficiencies** → bad memory management, redundant code, poor time complexity, unused variables.
 - **Provides instant suggestions** → highlights the problem and shows a possible fix or optimization
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2. *"Develop a platform that recommends personalized learning paths (tutorials, coding problems, projects) for software engineers to keep up with rapidly evolving technologies."*

- **Assess the user**
 - Understand the developer's current skills, experience, and learning goals.
 - Could track languages they know, frameworks used, or projects completed.
- **Curate learning material**
 - Select tutorials, coding exercises, and real-world projects **relevant to the user's skill level and interests**.
 - Filter content from online courses, coding platforms, blogs, or GitHub projects.
- **Adapt to tech trends**
 - Suggest topics and tools that are **emerging in the industry**, like AI/ML frameworks, cloud platforms, or new programming languages.

❖ **Personalize learning paths**

- Recommend **step-by-step sequences** to improve skills efficiently.
- Example: For a Python developer wanting to learn cloud computing:
 1. Python basics refresher
 2. AWS SDK tutorial
 3. Build a serverless project
 4. Deploy and optimize

❖ **Track progress and adjust**

- Track what the user has learned and adapt recommendations in real-time.
 - Offer challenges and projects at the right difficulty level.
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3. *"Create a platform that trains software engineers in secure coding practices by simulating real-world cyberattacks and providing real-time feedback."*

❖ **Simulate real-world cyberattacks**

- Examples: SQL injection, XSS, buffer overflow, insecure authentication, ransomware, API exploits.
- Safe sandbox environment where developers can experiment without risking actual systems.

❖ **Train developers in secure coding practices**

- Shows what **vulnerabilities look like in code**.
- Teaches how to **prevent them while coding**.

❖ **Provide real-time feedback**

- As developers write code or attempt challenges, the platform flags security issues **immediately**.
- Offers suggestions and explanations to correct vulnerabilities.

❖ **Gamified / interactive learning**

- Could include challenges, scoreboards, or "capture the flag" exercises to make learning engaging.

4. *"Build an intelligent task manager that integrates with GitHub/Jira and uses AI to prioritize developer tasks based on deadlines, complexity, and dependencies."*

1. **Integration with tools developers already use**

- GitHub: Issues, pull requests, commits.
- Jira: User stories, sprints, epics, tasks.

2. **AI-powered task prioritization**

- Automatically evaluates tasks based on:
 - **Deadlines** → which tasks are urgent.
 - **Complexity** → time/effort required to complete a task.
 - **Dependencies** → tasks that must be done first.

3. **Intelligent recommendations**

- Suggests **which task a developer should focus on next**.
- Helps plan sprints or daily work efficiently.

4. **Dynamic adjustments**

- Updates priorities in real-time if:
 - New tasks are added.
 - Deadlines shift.
 - Dependencies change.
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5. *"Develop a computer vision model that can identify and classify objects (e.g., traffic signs, crops, or defects in manufacturing) from images or videos."*

🔍 **Input:** Images or video frames from cameras, drones, or industrial systems.

🔍 **Processing:** Use **computer vision techniques** (like deep learning, CNNs, or object detection algorithms) to detect and classify objects.

🔍 **Output:** Labels or categories for each detected object.

- Example 1: Traffic signs → "Stop," "Yield," "Speed Limit 50"
 - Example 2: Crops → "Healthy," "Diseased," "Weeds"
 - Example 3: Manufacturing → "Defective," "Non-defective"
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6. *"Create an automated tool that selects the most suitable ML algorithm for a given dataset and problem type, reducing trial-and-error in model building."*

🔍 **Input:**

- Dataset (features and labels)
- Problem type (e.g., classification, regression, clustering)

🔍 **Processing:**

- Analyze dataset characteristics (size, feature types, missing values, distribution, correlation).
- Match these characteristics to suitable ML algorithms.
- Possibly suggest **hyperparameters** or preprocessing steps automatically.

🔍 **Output:**

- Recommended algorithms (e.g., Random Forest, SVM, XGBoost, Neural Network)
- Ranked list based on expected performance or suitability
- Optional: sample pipelines with preprocessing and evaluation metrics

7. *"Build an AI-powered intrusion detection and prevention system that identifies and blocks cyberattacks (e.g., DDoS, malware, phishing) with minimal false alarms."*

🔍 **Intrusion Detection**

- Continuously monitors network traffic, logs, and system activity.
- Detects abnormal or malicious behavior that may indicate:
 - DDoS attacks (overwhelming traffic)
 - Malware (viruses, ransomware, trojans)
 - Phishing attempts or unauthorized access

🔍 **Intrusion Prevention**

- Takes automatic actions to **block or mitigate threats** once detected.
- Examples:
 - Blocking suspicious IP addresses
 - Quarantining infected files
 - Alerting administrators for critical attacks

🔍 **AI-Powered Analysis**

- Uses machine learning to distinguish between **normal activity and attacks**.
- Minimizes **false positives**, so legitimate traffic or users aren't mistakenly blocked.

🔍 **Continuous Learning**

- The system improves over time by learning from new attack patterns.

8. *Design a predictive maintenance tool that analyzes network traffic logs and forecasts potential failures or bottlenecks before they occur."*

1. **Input:**

- Network traffic logs
- Metrics like bandwidth usage, latency, packet loss, error rates, server load

2. **Processing:**

- Use **machine learning or statistical analysis** to detect patterns that typically precede failures or congestion.
- Identify anomalies or trends indicating an impending issue.

3. **Output:**

- Early warnings for network engineers
 - Predicted type of failure (e.g., bandwidth bottleneck, router failure, overloaded server)
 - Suggested preventive actions (e.g., reroute traffic, increase capacity)
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9. *"Create a visualization dashboard that tracks end-to-end network performance (latency, packet loss, bandwidth usage) and suggests optimization actions."*

🔍 **Input / Data Sources:**

- Network traffic metrics: latency, packet loss, bandwidth usage, throughput, jitter
- Logs from routers, switches, servers, or monitoring tools

🔍 **Processing:**

- Aggregate and analyze the data to detect patterns, anomalies, or bottlenecks
- Optionally use ML/heuristics to suggest optimization actions

🔍 **Output:**

- Visual dashboard with graphs, heatmaps, or charts
- Alerts for performance degradation
- Actionable recommendations (e.g., reroute traffic, increase bandwidth, adjust QoS settings)

10. *"Develop an automated incident response bot that troubleshoots common network issues (e.g., IP conflicts, firewall misconfigurations) without human intervention."*

? Input / Detection

- Network events, logs, and alerts from routers, switches, firewalls, and servers.
- Common issues like:
 - IP address conflicts
 - Misconfigured firewall rules
 - DNS or gateway misconfigurations
 - Port or protocol errors

? Processing / Troubleshooting

- AI or rule-based engine analyzes the problem.
- Determines probable cause and best fix based on **predefined knowledge base or ML patterns**.

? Output / Action

- Automatically resolves the issue, e.g.:
 - Assigns a new IP to avoid conflicts
 - Updates firewall rules
 - Reconfigures network settings
 - Provides confirmation or report for the network team.
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11. *"Develop a cloud cost-optimization tool that monitors usage, identifies underutilized resources, and automatically recommends or applies cost-saving measures."*

1. **Input / Data Sources:**

- Cloud service usage metrics (compute instances, storage, databases, network bandwidth)
- Billing data from cloud providers (AWS, Azure, GCP, etc.)

2. **Processing / Analysis:**

- Detect **underutilized or idle resources** (e.g., EC2 instances running at low CPU, unused storage, idle VMs)
- Analyze usage patterns and trends to identify **potential cost savings**
- Optionally, use AI to predict future usage and optimize resource allocation

3. **Output / Actions:**

- Recommendations:
 - Stop, resize, or terminate underutilized instances
 - Move workloads to cheaper instance types or regions
 - Delete obsolete snapshots or storage
 - Optional automation: Apply these actions **automatically** with admin approval or pre-set policies
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12. *"Build a multi-cloud management platform that helps organizations avoid vendor lock-in by allowing seamless migration and workload balancing across AWS, Azure, and GCP."*

- ❖ You would build a platform that treats multiple public clouds as a single control plane. It lets teams move applications, data, and workloads between AWS, Azure, and GCP (or run them simultaneously), and automatically balance or schedule work to the cloud that

is best for cost, latency, compliance, or capacity — all while minimizing platform-specific lock-in.

13. *“Develop a compliance assistant that automatically checks cloud deployments against standards (GDPR, HIPAA, ISO, PCI-DSS) and generates audit-ready reports.”*

- You would build a system that continuously inspects cloud infrastructure, configurations, logs, and deployed services and evaluates them against formal regulatory frameworks and industry standards. The assistant automatically finds gaps, collects evidences, suggests or applies remediations, and produces formatted, audit-ready reports (with timestamps, evidence links, and change history) so security, legal, and operations teams can prove compliance without manual, labor-intensive checks.

14. *“Create an intelligent requirement analyzer that automatically detects ambiguities, missing details, and inconsistencies in requirements (user stories, specs, PRDs) before test planning or development begins.”*

- This tool reads requirements documents (user stories, acceptance criteria, PRDs, use-cases, functional specs) and uses NLP + rules + lightweight semantics to find problems that commonly derail projects: vague language, unstated assumptions, missing acceptance criteria, conflicting requirements, and incomplete non-functional requirements (performance, security, compliance). It flags issues, explains why they’re problems, suggests precise rewordings or missing details, and outputs a cleaned, testable spec for QA and dev.
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15. *“Build an AI-powered predictive maintenance tool that analyzes machine data (vibrations, temperature, noise) to forecast breakdowns before they occur.”*

- You would build a system that continuously collects sensor data from machines (accelerometers, thermistors, microphones, etc.), extracts meaningful signals, and uses ML models to predict when a component or machine is likely to fail. The tool raises early warnings, recommends preventive actions, and helps schedule maintenance so breakdowns — and costly downtime — are avoided.

16. *“Build a simulation tool that lets engineers test mechanical designs virtually (stress, fatigue, efficiency) so they can validate and iterate without expensive physical prototypes.”*

You would build a CAD-to-simulation platform that accepts mechanical designs (CAD models, assemblies, material specs, boundary conditions), runs physics-based analyses (static stress, modal/vibration, fatigue/life, thermal, fluid/CFD where needed), and returns actionable results (stresses, displacements, factor-of-safety, expected lifetime, efficiency metrics). Engineers can quickly iterate designs, explore “what-if” scenarios, and make data-driven decisions long before making hardware.

17. *“Develop an AI-powered system that predicts chemical process failures or hazards in industrial plants before they occur.”*

- ❖ You would build a monitoring + prediction platform that ingests real-time process data (temperatures, pressures, flows, compositions, valve positions, alarms, lab results), learns normal and risky patterns, and issues early warnings — ideally with root-cause hints and prescriptive mitigations — so

operators can act before an incident (trip, leak, runaway reaction, corrosion event, flare, etc.) happens.

18. “Build a smart monitoring solution for real-time detection of toxic emissions, leaks, or unsafe chemical handling in laboratories and factories.”

- ❖ You would create a system that continuously monitors chemical environments using sensors, IoT devices, and cameras to detect hazardous conditions—like toxic gas leaks, improper handling of chemicals, or spills. When unsafe conditions are detected, the system immediately alerts personnel, triggers safety protocols, and logs incidents for compliance and audit purposes. This helps prevent accidents, health hazards, and environmental violations.
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19. “Develop an AI-powered flight simulation tool that predicts aerodynamic performance and identifies potential structural or stability issues before physical prototyping.”

- ❖ You would build a simulation platform that takes aircraft or drone designs (geometry, control surfaces, material properties, and mass distribution) and predicts how they will perform in real-world flight. The system evaluates aerodynamics (lift, drag, stability, control response) and highlights potential structural or stability risks before any physical model is built. This reduces prototyping cost, speeds up design cycles, and allows engineers to optimize designs virtually.
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20. “Develop a real-time safety compliance tracker that ensures aerospace designs meet all regulatory standards and flags potential violations.”

- ❖ *This tool continuously analyzes aerospace design data (CAD models, specifications, material choices, structural analyses, control systems) and checks them against regulatory standards (FAA, EASA, ISO, MIL-STD, or industry-specific requirements). It automatically identifies violations, gaps, or risky design choices, so engineers can correct issues early—reducing costly rework, improving certification readiness, and ensuring safety.*
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21. *“Develop an autonomous fault-detection system for spacecraft or aircraft avionics that predicts anomalies using sensor data.”*

You would create a system that continuously monitors avionics sensors in spacecraft or aircraft—like temperature, voltage, current, pressure, and signal integrity—to detect unusual behavior or impending faults before they lead to failures. By predicting anomalies early, the system can alert operators or trigger autonomous corrective actions, improving safety and reliability.

22. *“Build an AI-powered platform that enables autonomous coordination of multiple drones for search, rescue, and relief operations during natural disasters.”*

You would create a system that allows a fleet of drones to work together autonomously during disasters such as floods, earthquakes, or hurricanes. The platform coordinates tasks like mapping affected areas, locating survivors, delivering emergency supplies, and avoiding collisions—without requiring constant human control. AI handles route optimization, task allocation, and real-time adaptation to changing conditions.

23. *“Create a software solution that manages solar power distribution and battery usage in CubeSats to extend mission life.”*

You would develop a system that monitors and optimizes how a CubeSat uses the energy generated by its solar panels and stored in its batteries. The software decides when to charge or discharge batteries, prioritize different subsystems (communication, sensors, payloads), and schedule high-energy activities to maximize mission duration and reliability in orbit.

24. “Develop a system that dynamically switches between algorithms based on data patterns to improve real-time decision-making.”

You would build a software system that monitors incoming data in real time, identifies its characteristics or patterns, and automatically selects the most suitable algorithm to process it. This ensures that decisions or predictions are always made using the method best suited for the current data context, improving accuracy, efficiency, and reliability.

25. “Design a tool that scans ML codebases and updates them to use the latest frameworks, functions, and best practices.”

You would create a system that automatically analyzes machine learning projects and suggests—or applies—updates to keep the code modern, efficient, and compatible with the latest ML frameworks (like TensorFlow, PyTorch, or scikit-learn). This includes upgrading deprecated functions, improving API usage, refactoring for better performance, and ensuring adherence to current best practices. The goal is to reduce manual maintenance effort and improve code reliability and efficiency.

26. “Healthcare providers often struggle with fragmented patient data due to the lack of integrated Electronic Health Record (EHR) systems. This leads to inefficiencies in accessing complete patient histories, delayed diagnoses,

and suboptimal treatment decisions. Develop an innovative solution that enables seamless integration and real-time access to patient records across multiple healthcare facilities, improving clinical decision-making and patient care.”

This problem addresses the issue where patient health information is scattered across different hospitals, clinics, and labs, often in incompatible formats. Doctors and medical staff cannot easily access a complete and up-to-date patient history, leading to delays, repeated tests, misdiagnoses, or less effective treatments. Implementing this solution would create a unified platform where healthcare providers can securely access and update patient records in real time, no matter where the patient received care.

- 27. Surgical procedures carry inherent risks, and current planning tools offer limited support for predicting potential errors. AI-based systems for surgical planning and real-time error prediction remain underdeveloped. Design an intelligent solution that leverages AI/ML to assist surgeons in preoperative planning, anticipate complications, and minimize surgical errors, ultimately improving patient safety and outcomes.”***

Surgery is complex, and mistakes or unforeseen complications can have serious consequences. Current surgical planning relies mostly on human expertise, existing imaging, and standard guidelines, which may not fully anticipate patient-specific risks. This solution would use AI/ML to analyze patient data, medical images, and historical surgical outcomes to assist surgeons in planning procedures, predicting potential errors, and providing real-time guidance during operations.

- 28. “Growth and developmental monitoring of patients, especially children, is often fragmented due to the lack of apps integrated with Electronic Health Records (EHRs). This limits healthcare providers’ ability to track long-term development trends and intervene timely. Develop an innovative solution***

that integrates growth and developmental tracking with EHR systems, providing actionable insights for healthcare professionals and improving patient outcomes.”

Monitoring a child’s growth and development over time—height, weight, cognitive milestones, immunizations—is critical for early detection of issues. However, existing tools often work in isolation and are not connected to EHRs, making it hard for doctors to see the full picture or intervene when trends indicate potential problems. This solution would integrate growth tracking apps with EHR systems, allowing seamless, real-time access to longitudinal data and providing actionable insights to healthcare providers.

29. *“Heart patients often require continuous monitoring, but current remote monitoring devices are limited in providing real-time, accurate data to healthcare providers. This gap can lead to delayed interventions and increased health risks. Design an innovative solution that enables real time remote monitoring of cardiac patients, integrating predictive analytics and alerts to improve patient safety and clinical outcomes.”*

Cardiac patients—especially those with heart failure, arrhythmias, or post-surgical conditions—need constant monitoring of their heart activity. Current devices may only capture snapshots, lack real-time alerts, or fail to integrate predictive insights. This solution would provide continuous, real-time cardiac monitoring, analyze data using AI/ML to predict complications, and alert healthcare providers immediately, improving patient safety and reducing emergency events.

30. ***“Create a secure, blockchain-based system for sharing patient health records across hospitals, consultants, and telemedicine platforms without privacy breaches.”***

Currently, patient health records are often siloed across hospitals, clinics, and telemedicine platforms, making it hard for healthcare providers to access complete, up-to-date information. Traditional data-sharing methods can risk privacy breaches or unauthorized access. This solution uses blockchain technology to enable secure, tamper-proof sharing of patient records. It ensures that only authorized personnel can access specific data, maintains auditability, and allows seamless sharing across multiple healthcare entities while preserving privacy.

31. *“Business managers often struggle with fragmented tools to manage operations, strategy, and staff performance, leading to inefficiency and poor decision-making. Develop an integrated platform that streamlines business operations, strategic planning, and workforce management in real time.”*

Many businesses use separate tools for tasks like project management, employee performance tracking, and strategic planning. This fragmentation makes it difficult for managers to get a complete view of operations, leading to delayed decisions, miscommunication, and inefficiency. This solution would provide a single, integrated platform that consolidates operational data, strategic insights, and workforce management, allowing managers to make informed decisions in real time.

32. *“HR managers face challenges in attracting top talent, ensuring effective onboarding, and maintaining employee satisfaction. Create an AI-powered HR solution that simplifies recruitment, enhances employee engagement, and personalizes training programs to improve retention.”*

HR managers often juggle multiple responsibilities: finding the right talent, onboarding them efficiently, and keeping employees engaged and satisfied. Existing tools are often fragmented and do not leverage AI to optimize these processes. This solution would use AI to streamline recruitment, create

personalized employee experiences, and provide data-driven insights for retention, making HR management more effective and efficient.

33. "Marketers struggle to accurately measure the impact of campaigns and personalize promotions for the right audience. Build a smart marketing tool that uses data analytics and AI to optimize campaign strategies, measure ROI, and improve customer targeting."

Marketing campaigns often fail to reach the right audience or generate the expected returns because of poor targeting, fragmented data, or lack of real-time analytics. This solution would leverage AI and data analytics to understand customer behavior, optimize campaign strategies, predict ROI, and personalize promotions, helping marketers make data-driven decisions and improve campaign effectiveness.

34. "Finance professionals face challenges in ensuring accuracy and compliance due to outdated or manual systems. Develop an intelligent financial management platform that automates budgeting, auditing, and tax planning with real-time compliance checks."

Finance professionals often spend significant time on manual data entry, reconciliations, and compliance checks, which increases the risk of errors and delays. Outdated systems also make it difficult to adapt to changing regulations. This solution would use automation and AI to streamline budgeting, auditing, and tax planning, while continuously ensuring compliance with real-time checks, improving accuracy and efficiency.

35. "Entrepreneurs often face obstacles in securing capital, scaling their ventures, and mitigating risks. Create a digital ecosystem that provides funding insights, growth strategies, and risk prediction tools to support entrepreneurial success."

Entrepreneurs frequently struggle to find investors, grow their startups effectively, and anticipate potential business risks. Existing platforms are fragmented, providing only partial information. This solution would create a comprehensive digital ecosystem that delivers funding guidance, growth recommendations, and risk predictions using data analytics and AI, helping entrepreneurs make informed decisions and increase their chances of success.

36. "Project managers frequently encounter challenges in balancing resources, tracking deadlines, and ensuring collaboration across teams. Build an AI-driven project management solution that predicts risks, automates scheduling, and enhances team communication

Project managers often struggle to keep projects on track due to resource constraints, missed deadlines, and poor team coordination. Existing tools may help track tasks but do not proactively predict risks or optimize schedules. This solution would use AI to forecast project risks, automatically optimize task schedules, and improve communication across teams, making project management more efficient and predictable.

37. "Banking officers face challenges with slow loan approvals, fraud detection, and customer service inefficiencies. Develop an AI-powered banking solution that automates loan assessments, enhances fraud detection, and improves customer experience."

Banking officers often struggle with lengthy loan approval processes, identifying fraudulent transactions, and delivering efficient customer service. Current systems are either manual or not intelligent enough to predict risks. This solution would leverage AI to automate and accelerate loan approvals,

detect fraud in real time, and improve overall customer interactions, making banking operations faster, safer, and more efficient.

38. "Chartered Accountants struggle with managing complex compliance requirements, preventing manual errors in auditing, and streamlining tax processes. Build a smart accounting system that automates compliance, ensures error-free audits, and simplifies taxation workflows."

Chartered Accountants (CAs) handle audits, taxation, and compliance, often using manual processes or fragmented tools. This can lead to errors, delays, and difficulty in staying updated with regulatory changes. This solution would automate compliance checks, reduce errors in audits, and streamline tax processes, making accounting more efficient, accurate, and reliable.

39. "Economists face challenges in processing massive datasets and delivering accurate economic forecasts for policy-making. Design a data driven platform that leverages AI/ML to analyze market trends, simulate policy impacts, and generate actionable insights."

Economists often deal with huge amounts of financial, social, and market data to create forecasts and policy recommendations. Manual analysis is slow and error-prone, and existing tools may not simulate the effects of policy changes effectively. This solution would use AI and ML to process large datasets, identify trends, simulate the impact of policies, and provide actionable insights to support better decision-making.
