

## **Research problems related to recent advancements in engineering:**

1. Addressing the problem of online fraud: Better detection through improved models.
2. Manhole Toxic Gas Identification and Alerting System-Implementation.
3. Developing Explainable AI models for complex decision-making processes.
4. Enhancing the privacy and security of federated learning in distributed systems.
5. Designing quantum algorithms for optimization and machine learning tasks.
6. Ensuring the safety and reliability of autonomous vehicles in unpredictable scenarios.
7. Integrating renewable energy sources into existing power grids efficiently.
8. Creating high-performance and cost-effective energy storage solutions.
9. Overcoming the stability and efficiency challenges of transparent solar cells.
10. Improving the stability and scalability of perovskite solar cell technologies.
11. Designing effective carbon capture and utilization methods for industrial applications.
12. Advancing green hydrogen production techniques using sustainable resources.
13. Developing sustainable materials for circular economy principles.
14. Designing smart materials with responsive and adaptable properties.
15. Overcoming challenges in shape memory alloy fatigue and durability.

16. Improving biomimetic engineering designs for enhanced functionality.
17. Enhancing the precision and safety of organ-on-a-chip technology for drug testing.
18. Developing seamless communication interfaces for neural engineering applications.
19. Improving the energy efficiency and performance of neuromorphic computing hardware.
20. Ensuring the safety and ethical considerations of synthetic biology applications.
21. Addressing off-target effects in CRISPR-based genetic engineering techniques.
22. Advancing the accuracy and speed of additive manufacturing techniques.
23. Overcoming material limitations in 3D printing for medical implants.
24. Enhancing the dexterity and control of soft robotics for various applications.
25. Developing wearable health monitoring devices with long battery life and accuracy.
26. Designing precision agriculture systems for optimal resource usage.
27. Ensuring reliable and secure communication in IoT-enabled farming environments.
28. Addressing challenges in battery technology for urban air mobility vehicles.
29. Developing secure and tamper-proof blockchain systems for supply chains.
30. Enhancing the resilience of critical infrastructure against cyber threats.
31. Designing efficient biometric authentication systems resistant to spoofing attacks.
32. Overcoming security vulnerabilities in quantum cryptography protocols.

33. Developing sustainable and energy-efficient building materials for construction.
34. Overcoming scalability challenges in the mass production of carbon nanotubes.
35. Designing composite materials with improved mechanical and thermal properties.
36. Advancing the integration of photonic integrated circuits in communication systems.
37. Addressing challenges in terahertz technology for practical applications.
38. Developing energy-efficient wireless communication solutions for 6G networks.
39. Ensuring the security and reliability of Li-Fi communication networks.
40. Designing cognitive radio networks with seamless spectrum sharing.
41. Overcoming challenges in implementing neuromorphic hardware in real-world applications.
42. Advancing the accuracy and effectiveness of digital twin simulations.
43. Enhancing the user experience and functionality of augmented reality systems.
44. Developing human-centered AI systems that understand and adapt to user emotions.
45. Improving natural language processing models for engineering-specific tasks.
46. Ensuring transparency and fairness in AI decision-making processes.
47. Designing sensor networks for real-time environmental monitoring.
48. Overcoming technical limitations in microfluidics for point-of-care diagnostics.
49. Developing lab-on-a-chip devices that are user-friendly and accessible.

50. Advancing personalized healthcare through accurate biomarker discovery.
51. Addressing challenges in bioinformatics analysis for drug development.
52. Developing sustainable and efficient routes for chemical synthesis.
53. Designing efficient electrocatalysts for clean energy conversion.
54. Overcoming noise and error challenges in quantum computing systems.
55. Developing scalable neuromorphic photonics platforms for quantum applications.
56. Enhancing the flexibility and performance of wearable sensors for health monitoring.
57. Designing secure and interoperable digital health platforms for telemedicine.
58. Overcoming regulatory challenges in deploying autonomous robots in manufacturing.
59. Advancing cognitive engineering approaches for seamless human-robot collaboration.
60. Designing sustainable transportation systems with minimal environmental impact.
61. Overcoming technical challenges in hyperloop and high-speed rail technologies.
62. Developing resilient and adaptive infrastructure designs for extreme weather events.
63. Enhancing disaster response technologies for faster and more effective interventions.
64. Addressing climate change adaptation through innovative engineering solutions.
65. Designing geoengineering methods to mitigate the impacts of climate change.
66. Developing efficient and user-friendly solutions for urban mobility challenges.
67. Addressing challenges in preserving cultural heritage using technology.

68. Designing energy-efficient aerospace propulsion systems for reduced emissions.
69. Overcoming technical limitations in smart water management systems.
70. Advancing clean and efficient combustion techniques for various fuels.
71. Designing disaster-resilient infrastructure for vulnerable regions.
72. Developing ethical guidelines and safeguards for AI and engineering applications.
73. Addressing challenges in microbial engineering for sustainable bioproduction.
74. Designing energy-efficient technologies for desalination processes.
75. Overcoming technical limitations in flexible energy storage devices.
76. Advancing geothermal energy systems for increased energy production.
77. Designing efficient electromagnetic space propulsion technologies.
78. Developing biomechanics-based solutions for enhanced human performance.
79. Addressing ethical and privacy concerns in data-driven engineering applications.
80. Designing adaptive and resilient control systems for uncertain environments.
81. Overcoming technical challenges in advanced water treatment technologies.
82. Advancing agricultural robotics and precision agriculture systems.
83. Designing climate-responsive architecture for energy-efficient buildings.
84. Developing microgrid and smart grid integration solutions for reliable power supply.
85. Overcoming technical challenges in hydrogen fuel cell technologies.
86. Addressing quantum networking challenges for secure and efficient communication.
87. Designing effective neurorehabilitation technologies for improved patient outcomes.

88. Developing safe and effective human augmentation technologies.
89. Advancing ocean engineering methods for sustainable aquaculture.
90. Designing solar-powered desalination systems for clean water production.
91. Addressing privacy concerns and data security in engineering applications.
92. Developing adaptive control systems for complex and dynamic environments.
93. Overcoming technical challenges in clean and efficient combustion processes.
94. Designing resilient and sustainable mining practices for resource extraction.
95. Advancing disaster-resilient infrastructure designs for vulnerable regions.
96. Addressing ethical considerations in AI and engineering decision-making.
97. Developing effective microbial engineering techniques for bioremediation.
98. Designing renewable energy-based solutions for desalination processes.
99. Overcoming technical limitations in quantum sensors and metrology.
100. Addressing challenges in ensuring data privacy in distributed systems.
101. Designing sustainable and efficient transportation solutions for urban areas.
102. Developing resilient and adaptive strategies for climate change adaptation.
103. Overcoming technical challenges in quantum communication technologies.
104. Addressing safety concerns in artificial general intelligence (AGI) applications.
105. Designing innovative solutions for clean and efficient hydrogen production.