**AIG110 Artificial Intelligence**

**Assignment 2**

**Group: 9**

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**Introduction**

Machine learning refers to a branch of artificial intelligence which develops an algorithm so computers can learn through data themselves for making predictions without being explicitly programmed. Rather than being explicitly told to do the activity, besides being programmed explicitly, ML models focus on the patterns in data. Therefore, better accuracy is established after a certain period when more and more information gets processed. This enables a wide range of applications, from image recognition to natural language processing, making ML a mighty weapon in many fields. This importance is reflected in increasing personalization in our lives, enhanced efficiency across industries, and better decision-making based on big data analysis. The role it has played so far in shaping daily experiences and improving various sectors will continue to grow. (OpenText, 2025)

**Application 1: Medical Imaging Analysis**

**Description:** Medical imaging analysis involves training, including X-rays, MRI, and CT scans. It is the algorithms that eventually learn from and identify patterns linked to specific diseases or conditions. After being trained, they are used to analyze new images regarding abnormal detection, condition classification, and even feature quantification in the severity of a disease. It aids radiologists and medical practitioners in making quick and correct diagnoses for better patient care. (R. P., 2024)

**Types of ML:** Medical imaging analysis usually employs the use of machine learning, such as supervised learning, where models are trained using labeled data, followed by CNNS, which are very good in image analysis. It also involves unsupervised learning, where it detects a pattern without a label and moves the learning, which fixes pre-educated models for special tasks. (R. P., 2024)

**Benefits:** It enhances the accuracy, speed of interpretation, consistency of results, early detection of disease, quantification of features, and optimization of resources. These are the advantages that have improved patient outcomes with better healthcare delivery. (Zheldak, P.,2025)

**Drawbacks:** The challenges of machine learning in medical imaging analysis include data quality issues, difficulties in generalization to new data, lack of interpretability of model decisions, high computational resource requirements, regulatory and ethical concerns, and challenges in integrating ML tools into clinical workflows. (Zheldak, P.,2025)

**Real-world Example:** Google's DeepMind has developed AI that can detect eye diseases by analyzing retinal scans.

**Ethical considerations:**

**Application 2: Customer Service Chatbot**

**Description:** The chatbots in customer service use machine learning, mainly through understanding user queries with natural language processing, recognizing users' intent for what they want, and learning from past interactions to improve responses. They make interactions personalized based on user data and perform sentiment analysis to adjust responses according to the emotional tone of the user. (Lime Chat, 2024)

**Types of ML:** Customer service chatbots need variants of machine learning, which means training systems using supervised and unsupervised learning to create patterns from data and even reinforcement learning trial-and-error methods to optimize their performance following received feedback. They embed many techniques ranging from natural language understanding to language generation. (Lime Chat, 2024)

**Benefit:** It follows 24x7 availability, immediate answers, cost efficiency, scalability, consistent answers, and rich data gathering on customer preference, which are all benefits that come with customer service chatbots. Perhaps such benefits might create higher quality for general customer service and support. (Lime Chat, 2024)

Drawback: Challenges of customer service chatbots include a limited understanding of complex queries, a lack of human touch, potential technical issues, reliance on the quality of training data, and integration difficulties with existing systems. (Lime Chat, 2024)

**Real-world Example:** Sephora uses chatbots to assist customers by answering questions about products, providing personalized recommendations based on preference and helping with order tracking. (Lime Chat, 2024)

Ethical considerations:

**Application 3: Autonomous Vehicles**

**Description:** Autonomous cars process huge amounts of information coming from sensors, cameras, and radar with a view of the world outdoors by using machine learning. Specifically, ML algorithms assist such vehicles in identifying objects, recognizing road signs, and predicting pedestrian behavior, coupled with that of other cars on the road. A system will drive more in real-world scenarios to be better equipped with self-improving decisions to handle tricky situations on roads graciously and efficiently. As time goes on and they experience more situations, their performance further improves to make them even more road reliable. (Marshall, A. D. A.,2021)

**Type of ML:** In general, autonomous vehicles depend on how the processes of supervised and unsupervised learning intertwine with reinforcement learning. Supervised learning is mainly about training several models with images and videos to identify objects and their decisions to drive. As opposed to this, unsupervised learning can also be seen by clustering or detecting anomalies to learn a pattern or an anomaly in data. Fine-tuning them with reinforcement learning, therefore, enables them to learn by trial and error- just drive, improve performance, and learn in the process. (Hong, Z.,2024)

**Benefits and drawbacks:** Some advantages of these vehicles are road safety, reduction in accidents, mobility for persons with disability challenges, and intelligent transportation systems. However, some challenges entail some technical hurdles, regulatory obstacles, ethical problems, and issues related to a human driver’s job loss. An autonomous driving car, by nature, all electronic, gives rise to questions of liability when an accident occurs, ethics and morals when emergencies arise, and changes that might be forced upon public transportation. (Marr, B., 2021)

**Real-world Example:** Waymo has developed a fleet of fully autonomous vehicles that use ML to navigate complex urban environments. (OpenText, 2025)

**Ethical considerations:** Self-driving cars are subjected to many ethically controversial problems, most associated with bias and equitability, privacy concerns, job displacements, and accountability, amongst several others. Indeed, ML algorithms of auto-driving cars can be biased against the data set they are being trained upon, thus becoming equable in treating various sets of people. Sensitive data regarding the passengers and patterns of travel may be collected. Huge job replacement: the auto-driving cars will replace the jobs of millions of human drivers, further causing unemployment and disruption in economic matters. One of the major huge issues will involve accountability since in a situation where an accident occurs because of an auto car, nobody is sure who shall be responsible, whether the manufacturer, the developer, or probably the human operator.

**References**

What is machine learning, and why is it important? OpenText. (n.d.). (2025) retrieved from <https://www.opentext.com/what-is/machine-learning>

R, P. (n.d.). (September 24,2024) Machine learning (ML) in Advanced Medical Imaging Analysis. Retrieved from  [https://www.intuz.com/blog/machine-learning-in-medical-imaging-analysis]( https://www.intuz.com/blog/machine-learning-in-medical-imaging-analysis)

Zheldak, P. (2025, February 7). Machine learning in healthcare: [7 real use cases included]. Machine Learning in Healthcare: [7 Real Use Cases Included]. <https://acropolium.com/blog/machine-learning-in-healthcare-use-cases-benefits-and-success-stories/#:~:text=ML%20algorithms%20are%20trained%20on,the%20human%20eye%20may%20miss.>

Organization. (2024, October 1). How machine learning transforms customer support chatbots. LimeChat. <https://www.limechat.ai/blog/customer-support-chatbot-with-ml-guide>

Marshall, A. D. A. (2021, September 9). What is a self-driving car? The Complete Wired Guide. Wired. Retrieved from <https://www.wired.com/story/guide-self-driving-cars/>

Hong, Z. (2024, July 14). Autonomous vehicles: The role of machine learning in safe and efficient driving. Medium. Retrieved from <https://medium.com/@zhonghong9998/autonomous-vehicles-the-role-of-machine-learning-in-safe-and-efficient-driving-51fca43e8155>

Marr, B. (2021, December 10). 5 ways self-driving cars could make our world (and our lives) better. Forbes. <https://www.forbes.com/sites/bernardmarr/2020/07/17/5-ways-self-driving-cars-could-make-our-world-and-our-lives-better/>