Marmara University
Engineering Faculty
Department of Electrical and Electronics Engineering
Undergraduate Project Topics offered by Cabir Vural

Topic	**Brief Explanation**
Multi query video retrieval	Fast and efficient search from a large-scale video database has become an important issue. In the video retrieval studies conducted so far, single videos have been used as queries most of the time. However, by nature, a video signal is usually related to more than one semantic. Consequently, annotated videos usually have a multi-label character. The student will develop an efficient and fast multi-query video retrieval framework that supports an arbitrary number of video queries. Database and query hash codes will be generated by a deep hashing method that not only generates hash codes but also predicts query labels when they are chosen outside the database. The retrieval is based on the Pareto front multi-objective optimization method. Simulations will be carried out to determine retrieval accuracy and efficiency of the framework.
Visual Dialog	Visual Dialog requires an AI agent to hold a meaningful dialog with humans in natural, conversational language about visual content. Specifically, given an image, a dialog history, and a question about the image, the agent has to ground the question in image, infer context from history, and answer the question accurately. Visual Dialog datasets have been released. The student will develop neural encoder-decoder models for Visual Dialog. A retrieval-based evaluation protocol for Visual Dialog where the AI agent is asked to sort a set of candidate answers will be used and evaluated on different metrics. Putting it all together, the student will develop a visual chatbot for a specific task.
Optimum routing in computer networks	Reinforcement learning (RL) provides a framework by which a system can learn from its previous interactions with its environment to efficiently select its actions in the future. It is commonly accepted that RL is suitable for solving optimization to routing in computer networks. Since the mid-1990s, over 60 protocols have been proposed, with major or minor contributions in the field of optimal route selection to convey packets in different types of communication networks under various user QoS requirements. The student will review literature on the topic. Then, the student will develop an RL based routing algorithm.
Practical reinforcement learning in dynamic treatment regimes	Reinforcement learning (RL) is a general computational approach for optimizing a sequence of actions for a dynamic system. The student will develop a framework for applying RL algorithms to derive optimal dynamic treatment regimes. The goal of the RL approach is to discover dynamic treatment regimes directly from data The power of the method lies in its ability to do this optimization without requiring models of the underlying disease processes, while still permitting the incorporation of insights learned from such a model. The student will overview of the basic RL algorithms, select a particular method and apply it to the problem of automatically learning dynamic treatment regimens (DTRs) in a case study. Case study will be selected by the instructor and student together.
Topic selected by the student	The topic offered by the student will be considered for approval.