

Personalized Exercise Recommendations with Knowledge Graphs

Anirban Acharya, Abhirup Dasgupta, Dominick Iadevaia, Johnny Sun

¹Rensselaer Polytechnic Institute
2275 East Bayshore Road, Suite 160
Palo Alto, California 94303
publications22@aaai.org

Abstract

Exercise is crucial for overall health, improving cardiovascular fitness, muscle strength, and mental clarity. Many struggle to find safe and effective workouts that fit their busy lives and personal goals. A personalized exercise plan that includes flexibility, convenience, and enjoyment, while considering any injuries or illnesses, can improve adherence to fitness goals and promote long-term health benefits. Our work introduces a knowledge graph-based approach to help individuals select appropriate exercises based on their goals while factoring in any illnesses or injuries they may have. The underlying ontology for the knowledge graph was developed based on information and concepts from various reputable sources, such as Physical Activity Ontology (Kim, Mentzer, and Taira 2019), the Ontology-Based Physical Exercise Recommender System for Underweight Using Ontology and Semantic Web Rule Language (Juliant, Baizal, and Dharayani 2023) cross-referenced with popular websites and books focusing on health and physical exercise such as Encyclopedia of muscle & strength (Stoppani 2005), muscleandfitness.com to ensure a comprehensive and reliable framework. The gap between concepts and expected output was bridged by developing semantics using description logic in Protege. The framework was then tested on a developed use case that focuses on individuals seeking customized training plans that accommodate their specific health conditions and fitness objectives which were represented by different competency questions. The framework was assessed for its ability to match the recommended exercises with the user goals, comparing them with a predefined set of exercises expected from the ontology. This evaluation demonstrated the effectiveness of using an ontology-based approach to personalize fitness recommendations for users with varying needs.

Introduction

The main purpose of our application is to help people discover exercises and a basic one-week plan that suit their unique levels of fitness, preferences, and any injuries they may have. Users can be anyone from professionals to novices in the health and wellness area. Although our appli-

cation is not designed to take the place of an expert, it acts as a helpful tool to support their advice by offering users easy-to-access and personalized workout choices that can improve their fitness journey. The health goals our application currently supports are increase cardiovascular fitness, recovery from injury, fat loss, muscle gain, mass gain, improve flexibility, strength gain, develop explosiveness, and functional training.

Technical Approach

Structuring

The ontology was organized to represent key components of exercise science: exercise type, goals, targeted muscles, injury considerations, and intensity levels. The terms were gathered from trusted sources, such as academic journals and fitness literature, ensuring a solid foundation. The definitions were sourced from reliable dictionaries and expert publications for clarity. Additional terms, labels, context, and usage examples were collected to enhance the ontology, serving as the foundation for a knowledge graph that provides recommendations.

The Use Case

The Conceptual Model

Related Work

Evaluation

Discussion

Conclusion

Acknowledgments

References

- Juliant, C. L.; Baizal, Z.; and Dharayani, R. 2023. 1. Ontology-Based Physical Exercise Recommender System for Underweight Using Ontology and Semantic Web Rule Language. *Journal of Information System Research (JOSH)*.
- Kim, H.; Mentzer, J.; and Taira, R. K. 2019. 1. Developing a Physical Activity Ontology to Support the Interoperability of Physical Activity Data. *Journal of Medical Internet Research*.
- Stoppani, J. 2005. 1. *Encyclopedia of muscle & strength*. Human Kinetics.