

# **Genetics of Cardiovascular Disorders: An *in-silico* Analysis using Protein Structural and Interaction Information**

*A Major Project dissertation submitted  
in partial fulfilment of the requirement for the degree of*

**Master of Technology  
In  
Bioinformatics**

*Submitted by*

**Prerna Jain**

**(DTU/12/M.TECH/404)**

**Delhi Technological University, Delhi, India**

*Under the supervision of*

**Dr. Yasha Hasija**



Department of Biotechnology  
Delhi Technological University  
(Formerly Delhi College of Engineering)  
Shahbad Daulatpur, Main Bawana Road,  
Delhi-110042, INDIA

# DECLARATION

I, Prerna Jain hereby declare that the M. Tech. dissertation entitled “**Genetics of Cardiovascular Disorders: An *in-silico* Analysis using Protein Structural and Interaction Information**”, submitted in partial fulfilment of the requirement for the award of the degree of Master of Technology in Bioinformatics, Delhi Technological University (Formerly Delhi College of Engineering, University of Delhi), is a record of original and independent research work done by me under the supervision and guidance of Dr. Yasha Hasija, Assistant Professor and Associate Head, Department of Biotechnology, Delhi Technological University, New Delhi. The information and data enclosed in this dissertation is original and has not formed the basis of the award of any Degree/Diploma/Associateship/Fellowship or other similar title to any candidate of any university/institution.

**Date:**

**Prerna Jain**

M. Tech Bioinformatics  
Department of Biotechnology  
Delhi Technological University  
Shahbad Daulatpur, Main Bawana Road,  
Delhi – 110042, India

# ACKNOWLEDGEMENT

Successful completion of my work would be incomplete unless I mention the name of persons who made this possible. Guidance and encouragement served as a beacon of light and crowned my efforts into success.

I would like to take this opportunity to express my deep sense of gratitude to my respected Vice Chancellor **Prof. P.B. Sharma** for constantly motivating me for exploring new ventures. I thank **Dr. Yasha Hasija**, Assistant Professor and Associate Head, Department of Biotechnology, DTU, for her involvement, skillful assistance, guidance and trust during the tenure of this project. Without her valued suggestion and cooperation this project would not have taken shape. It has indeed been an enriching scientific experience and I would like to thank her for providing me an opportunity to work under her guidance.

I am grateful to my seniors **Ms Isha Shrivastva**, **Ms Vinita Mishra** for guidance and help in my work and have been a source of inspiration to be focussed and dedicated towards my work. I also thank all those who have directly or indirectly helped me in completing my project and in writing and critically assessing this report.

Finally I would like to thank my parents whose love, support and faith in me were a constant motivating factor during the course of this study.

**Prerna Jain**

2K/12/BIO/22

# CONTENTS

<b>TOPIC</b>	<b>PAGE NO</b>
<i>LIST OF FIGURES</i>	i
<i>LIST OF TABLES</i>	ii
<i>LIST OF ABBREVIATIONS</i>	iii
<b>1. ABSTRACT</b>	1
<b>2. INTRODUCTION</b>	2
<b>3. REVIEW OF LITERATURE</b>	4
3.1 Protein interfaces – The regions where proteins interact	8
3.2 Physical and chemical properties of Protein-Protein Interfaces	9
3.3 Protein networks and diseases	12
3.4 Machine learning and methods	18
<b>4. METHODOLOGY</b>	27
4.1 Building training sample	27
4.2 Retrieval of dataset	27
4.3 Retrieval of the interacting proteins	28
4.4 Structural interaction network	29
4.5 Identification of interface structure using Intercatome3D	30
4.6 Interface property analysis	31
4.7 Classification analysis – algorithm and analysis	32
4.8 DAVID analysis	37
<b>5. RESULTS</b>	38
5.1 Proteins associated with cardiovascular disorders	38
5.2 Protein-Protein Structural Interaction Network	40
5.3 Deducing interface parameters using 2P21inspector	43
5.4 Classification and Prediction analysis	48
<b>6. CONCLUSION</b>	57
<b>7. DISCUSSION AND FUTURE PERSPECTIVE</b>	58
<b>8. REFERENCES</b>	60