



A Social Network Based Optimisation Approach on Patient Admission Scheduling Problem

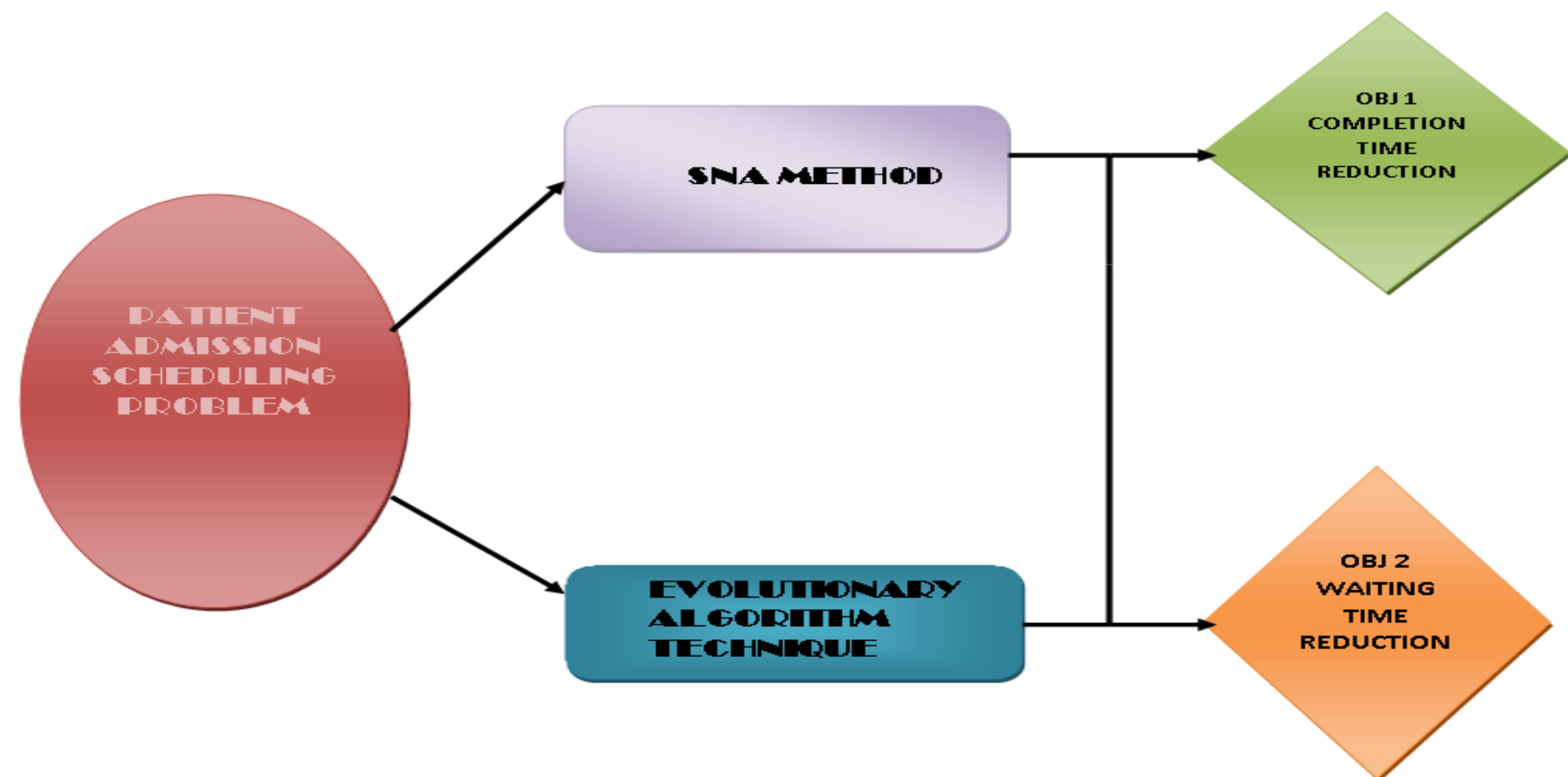
By
Venkat Anirudh Kodali
L Sai Prudhvi Siddhartha
Kakarla Manoj
Shaik Shama Zabeen

Under the guidance of
Prof. Dr. Vijay Kumar M

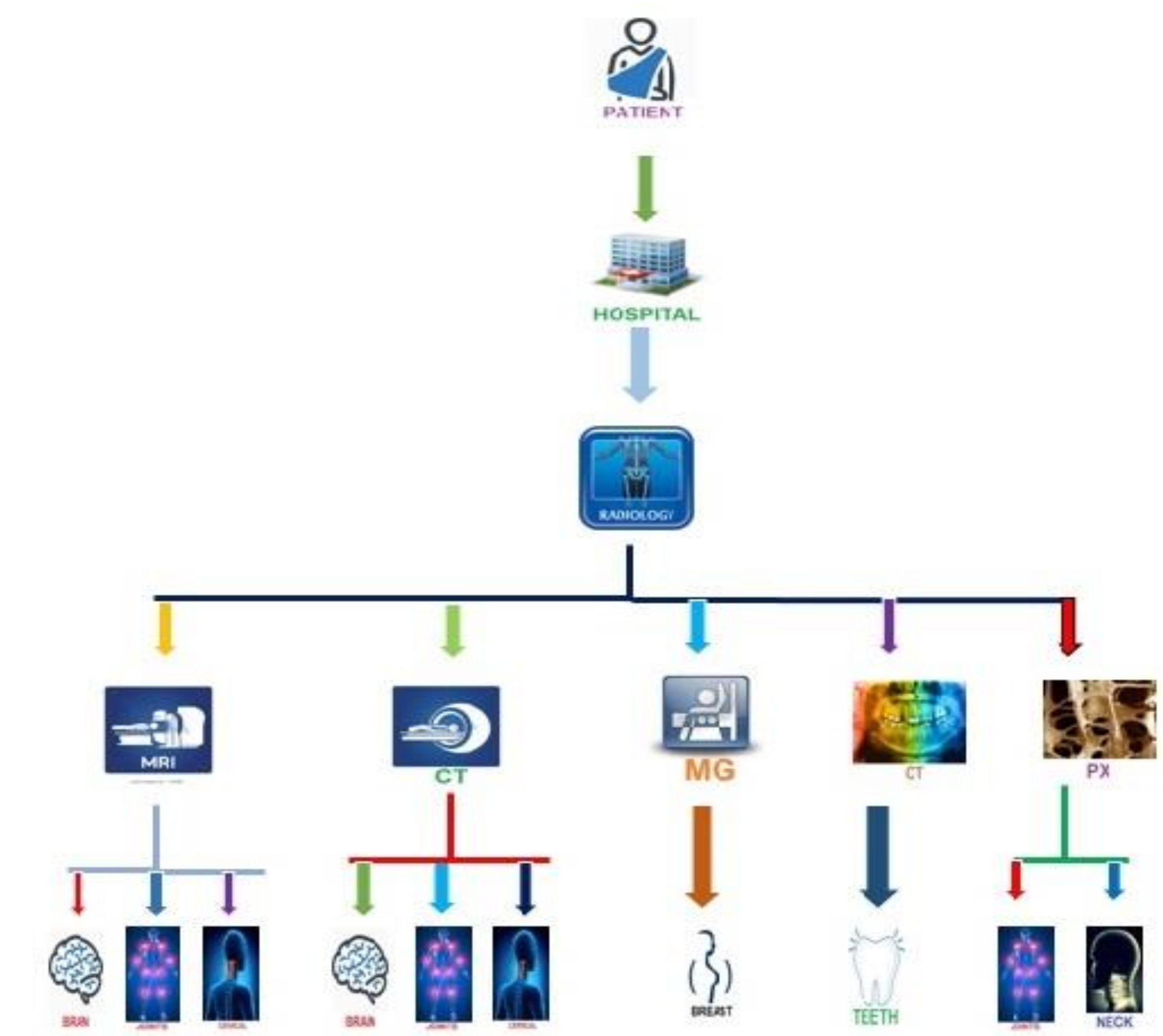
School of Mechanical and Building Sciences
Vellore Institute Of Technology Vellore, Tamil Nadu-632014 India.



Graphical Abstract



Problem definition



Mathematical Formulation

Minimization of objectives

$$j_{i,j} = j_{o,i,j} + p_{i,j} + \square wt_{i,j} \quad (1)$$

$$Vwt_{i,j} = t_{o,i,j} - (t_{o_0} + p_{i,j}) \quad (2)$$

Subjected to constraint s

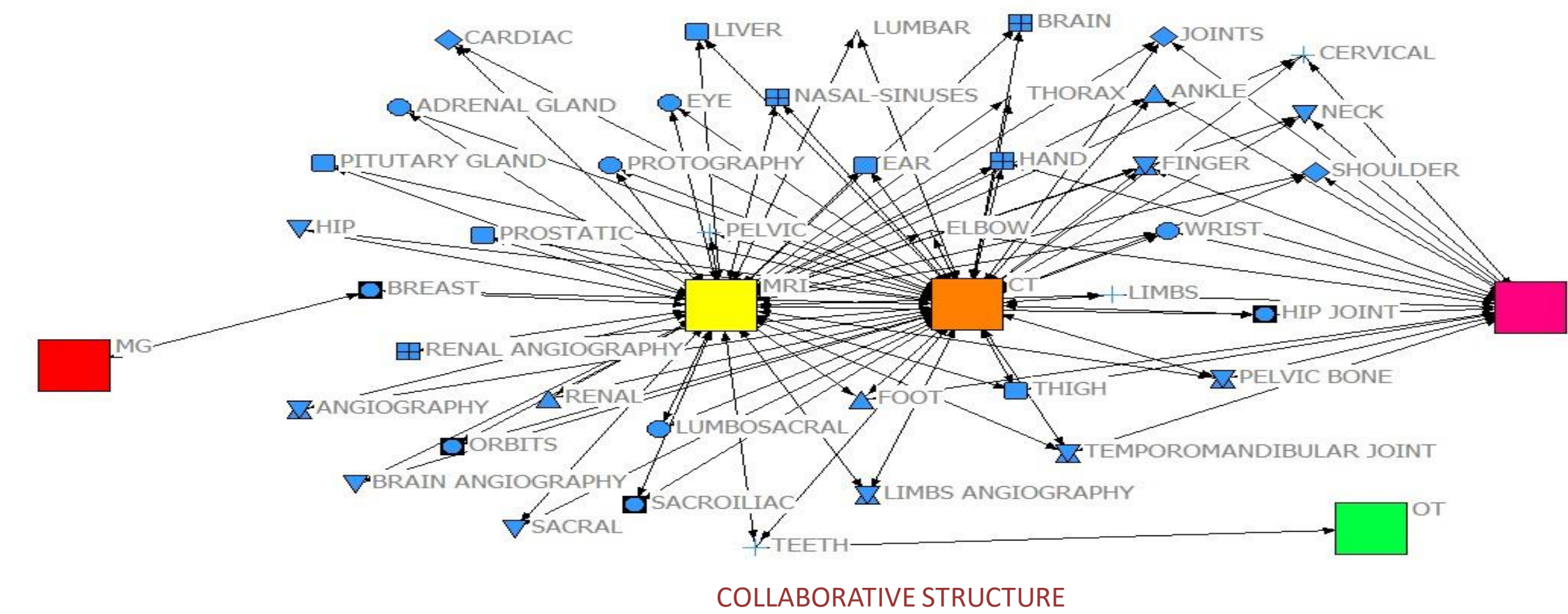
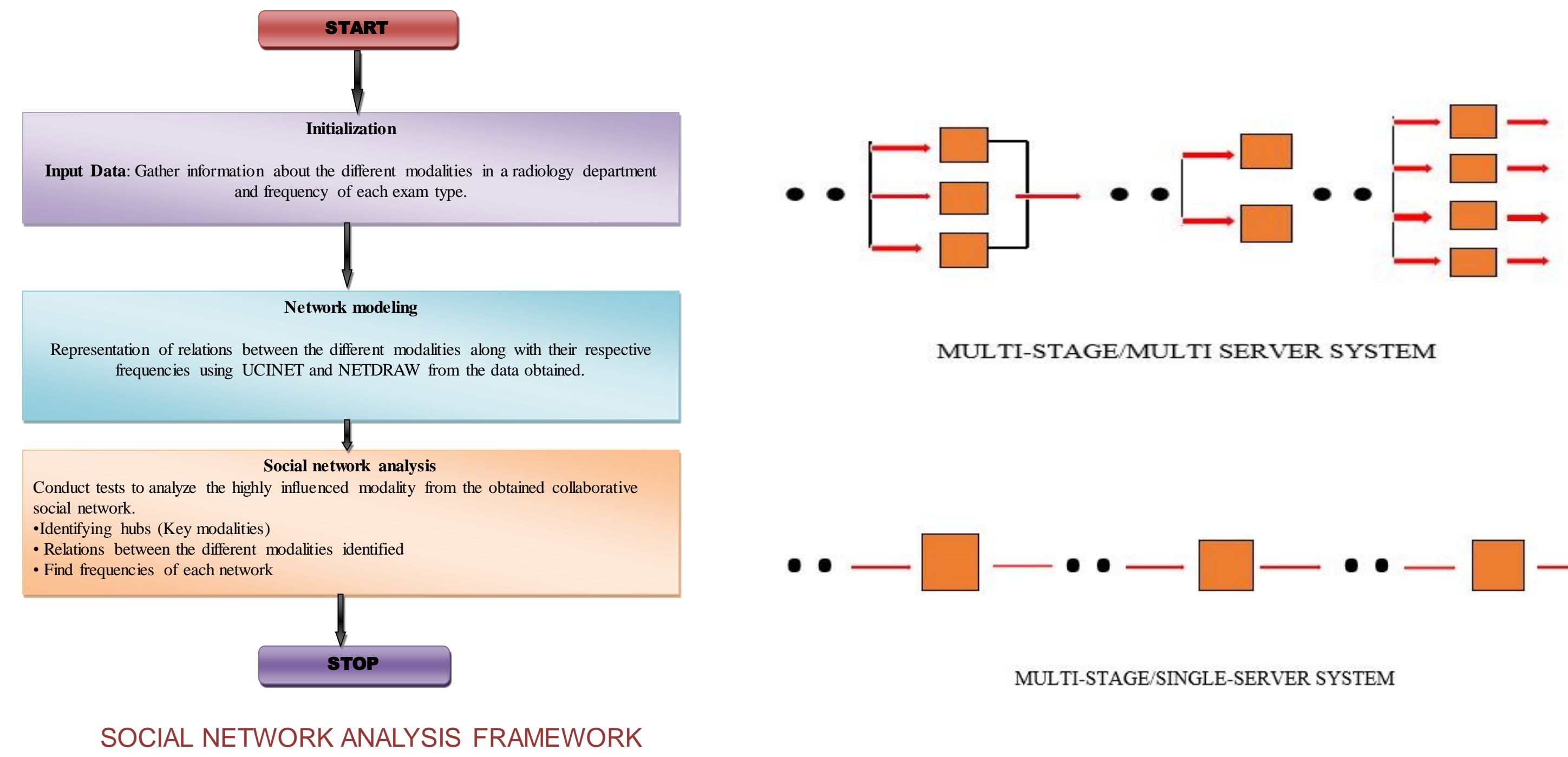
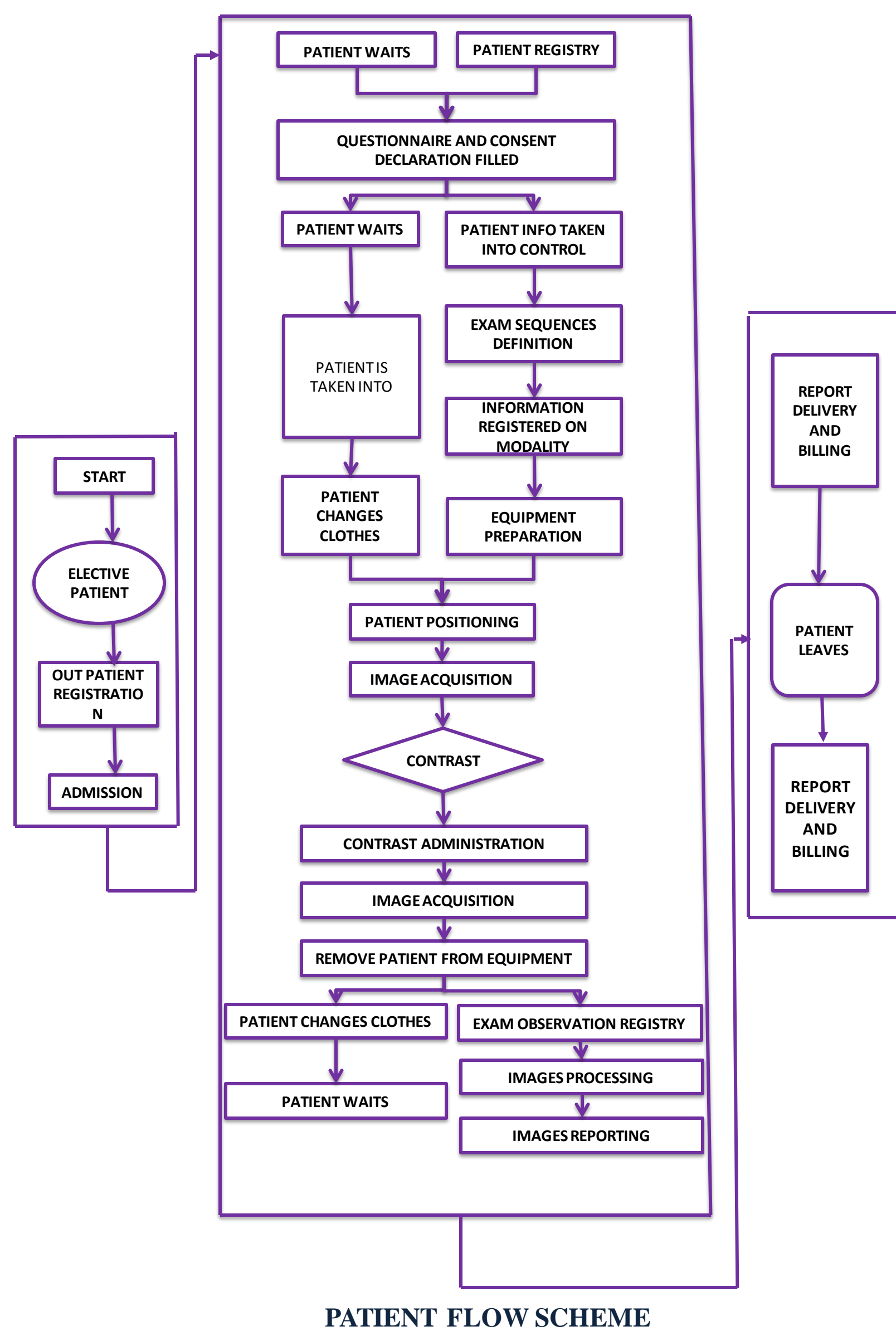
$$\sum_{i,j} = \begin{cases} w \rightarrow j_{o,i,j} \geq j_{i,j} \\ 0 \rightarrow j_{o,i,j} = j_{i,j} \end{cases} \quad (3)$$

$$\eta_{i,j} = \begin{cases} zw \rightarrow \square wt_{i,j} = 0 \\ nzw \rightarrow \square wt_{i,j} = j_{o,i,j} - (j_{o,i,j} + p_{i,j}) \end{cases} \quad (4)$$

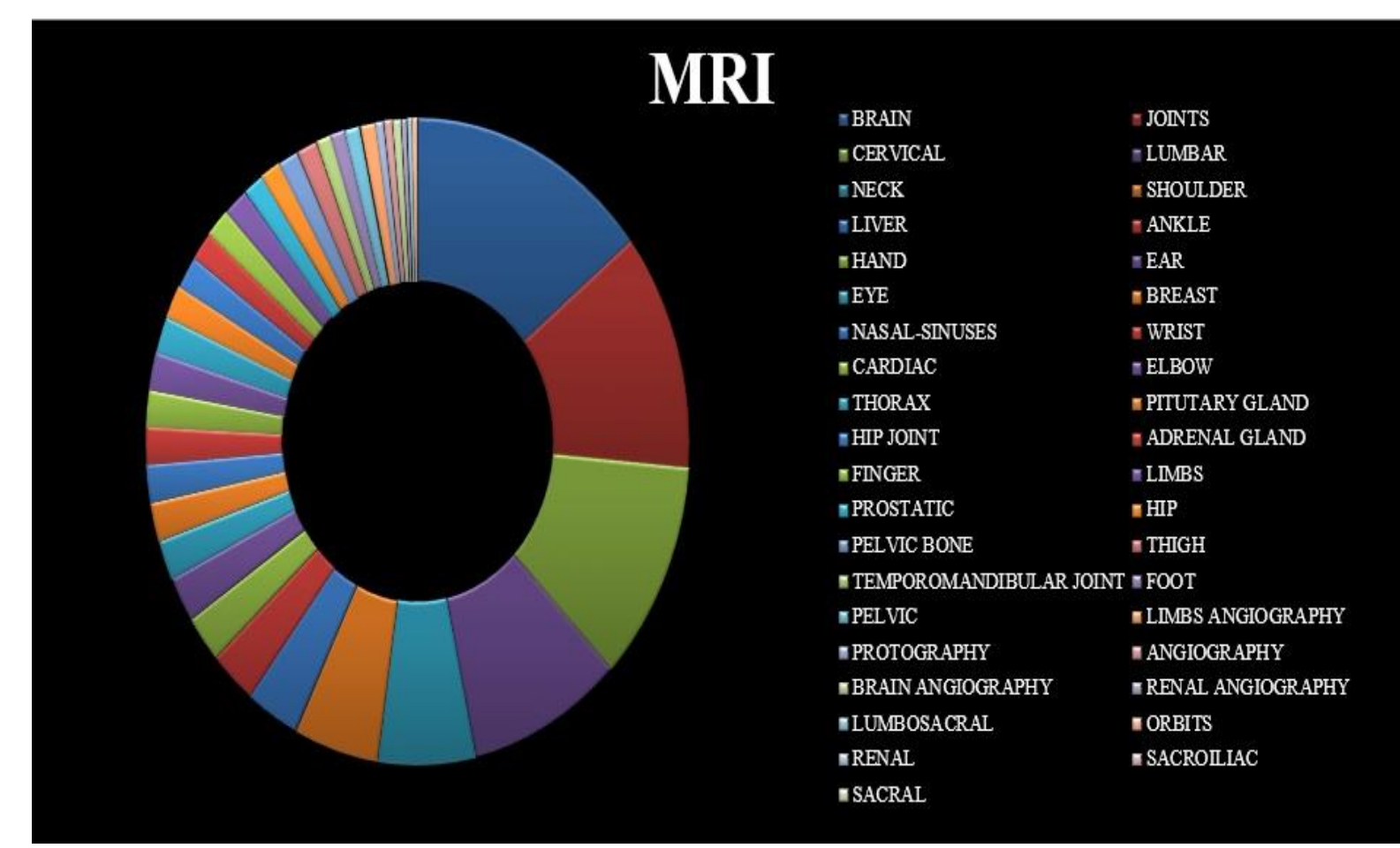
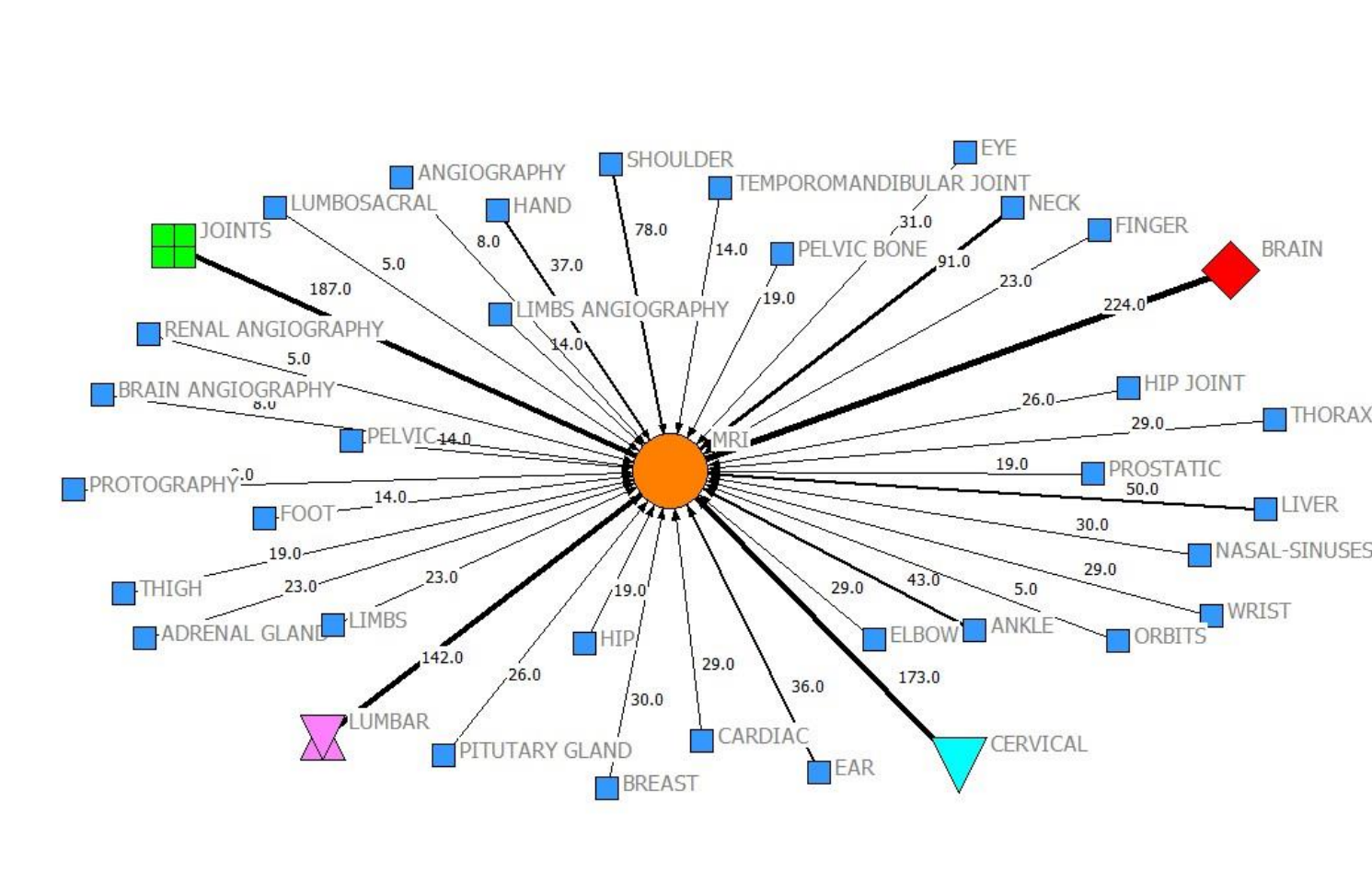
$$p_{i,j} > 0, \forall i \in j, j \in j \quad (5)$$

$$\mu_{i,j} - 3\sigma_{i,j} \wedge 2 \leq p_{i,j} \leq \mu_{i,j} + 3\sigma_{i,j} \wedge 2, \forall i \in j, j \in j \quad (6)$$

Methodology

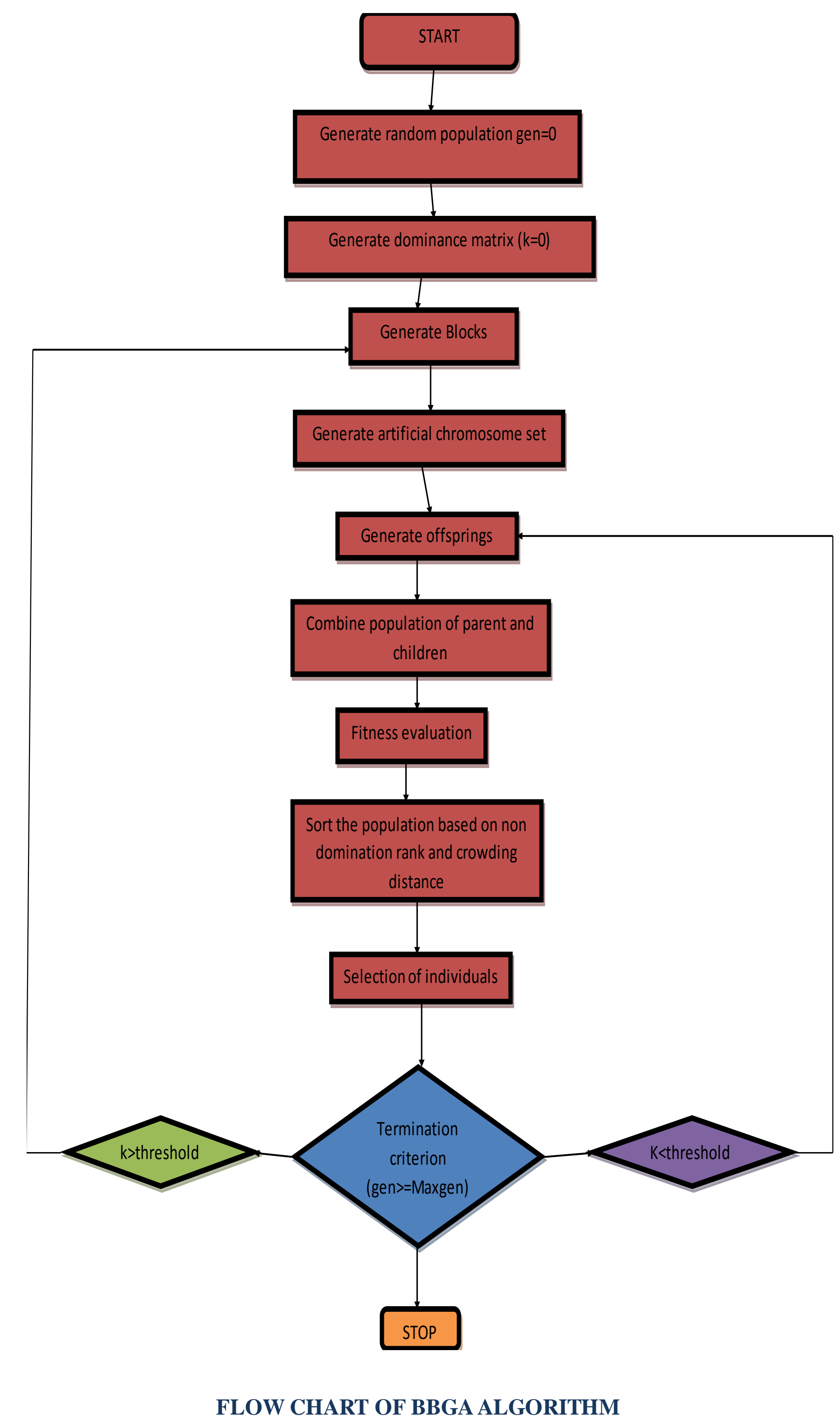


Results



| Parameter | Exam With Contrast | Exam Without Contrast | Exam With Contrast | Exam Without Contrast |
|--------------------|--------------------|-----------------------|--------------------|-----------------------|
| Average | 20.42 | 26.51 | 26.72 | 25.92 |
| Median | 19.52 | 25.52 | 25.17 | 26.65 |
| Standard Deviation | 4.48 | 6.06 | 8.25 | 4.91 |

| Performance Measure | BBGA |
|-----------------------|------|
| Total Completion Time | 86 |
| Total Waiting Time | 9 |
| F _{max} | 95 |



References

1. Fei, H., Meskens, N., Chu, C. (2010). A planning and scheduling problem for an operating theatre using an open scheduling strategy. Computers and Industrial Engineering, 58, 221-230.
2. Bailey NT. A study of queues and appointment systems in hospital out-patient departments, with special reference to waiting-times. J Roy Stat Soc Ser B Met 1952; 14(2):185-99.
3. Cayirli T, Veral E. Outpatient scheduling in health care: a review of literature. Prod Oper Manage 2003; 12(4):519-49.
4. Chen N, Zhan Z, Zhang J, Liu O, Liu H. A genetic algorithm for the optimization of admission scheduling strategy in hospitals. In: 2010 IEEE congress on evolutionary computation (CEC), Barcelona; 2010.
5. Connelly L, Bair A. Discrete event simulation of emergency department activity: a platform for system-level operations research. Acad Emerg Med 2004; 11(11):1177-85.
6. Garg L, McClean S, Meenan B, Millard P. A non-homogeneous discrete time Markov model for admission scheduling and resource planning in a cost or capacity constrained healthcare system. Healthc Manage Sci 2010; 13(2):155-69.
7. Granja C, Mendes J, Janela F, Soares J, Mendes A. Optimisation-based on simulation: a diagnostic imaging department case-study. In: Second international conference on information, process, and knowledge management (eKNOW), Saint-Marteen; 2010.
8. Diwas SK, Terwiesch C. The effects of focus on performance: evidence from California Hospitals. Manage Sci 2011; 57(11):1897-912.
9. J.M. Molina-Pariente, V. Fernandez-Viagas, J.M. Framinan Integrated operation Room planning and scheduling problem with assistant surgeon dependent surgery duration. Compute and industrial engineering 2015