In intelligent systems, constraint satisfaction is the process of firing rules for finding a solution to a set of constraints which are used to impose some conditions that the variables should satisfy. Hence, a solution provides a set of values for the variables that satisfies all constraints. Constraints satisfaction problems are useful for making decisions on constraints on variables. In temporal databases, temporal constraint satisfaction problems are formulated to represent the integrity constraints. Among these, two approaches are followed by various researchers’ namely instant based approach and interval based approach. Both of these approaches must be integrated with a suitable temporal logic. The main advantage of using temporal constraints in an application is that it enhances the reasoning capability of the temporal logic.

**Temporal Constraint Network Model**

In this work, a temporal constraint network has been designed to solve the temporal constraint problem which maintains data integrity in social network database. The definitions used in this work are based on both the general constraint satisfaction problem artificial intelligence and temporal constraint satisfaction problem proposed by Rina et al (1991). The Temporal Constraint Satisfaction Problem (TCSP) used in this research work considers a set of variables, \( X_1, X_2, \ldots, X_n \), having continuous time domains. In this model, each variable represents a time point pertaining to the activities
performed by group members of a social networking group. Moreover, each
temporal constraint is represented by a set of time intervals as shown in
Equation A1.1.

\[ \{I_1, \ldots, I_n\} = \{[a_1, b_1], \ldots, [a_n, b_n]\} \]  \hspace{1cm} (A1.1)

The temporal constraint can be either unary or binary. Based on
unary constraints domain integrity rule is maintained in this work because the
unary constraint provides a domain to each variable. Therefore, the temporal
relationship used to specify the domain integrity rule is formulated using the
Equation A1.2.

\[ (a_i \leq X_i \leq b_i) \lor \ldots \lor (a_n \leq X_i \leq b_n) \] \hspace{1cm} (A1.2)

In this work, unary temporal constraints are denoted by \( T_i \) and
binary constraints are denoted by \( T_{ij} \), which provides the permissible values
for the intervals based on the distance between variables as shown in
Equation A1.3.

\[ (a_i \leq X_j - X_i \leq b_j) \lor \ldots \lor (a_n \leq X_j - X_i \leq b_n) \] \hspace{1cm} (A1.3)

Temporal reasoning is performed by building a temporal constraints
network as shown in Figure 4.4 for the interactions carried out by five
members of a social network group at times a,b,c,d,e,f,g,h and NOW.
Temporal reasoning is performed by applying the Allen’s (1983) interval algebra operators on the edges of the temporal constraint network. The operators used in this work for temporal reasoning are as follows.

- \([a,b]\) before \([c,d]\) iff \(b < c\)
- \([a,b]\) after \([c,d]\) iff \(a > d\)
- \([a,b]\) during \([c,d]\) iff \((a < c)\) and \((b < d)\)
- \([a,b]\) equals \([c,d]\) iff \((a=c)\) and \((b=d)\)
- \([a,b]\) adjacent \([c,d]\) iff \((c-b=1)\) or \((a-d=1)\)
- \([a,b]\) overlaps \([c,d]\) iff \((a < d)\) and \((c < b)\)
- \([a,b]\) follows \([c,d]\) iff \((a-d=1)\)
- \([a,b]\) precedes \([c,d]\) iff \((c-b=1)\)
These temporal reasoning operators are used to make decisions on clusters to be formed by different members. The outcomes of temporal reasoning are used along with distance measures to form clusters. Since the interests of members vary from time to time reasoning is performed with respect to planning, prediction and learning in this work.