**Goal Models Analysis**

* + **Propagate satisfaction** values through the model
  + Measure **metrics** over the model
  + Apply **planning** techniques
  + Run **simulations**
  + Perform **checks** over models

**Satisfaction Analysis**

* Example Analysis Questions:
  + What is the effect of this alternative?
  + Can this goal be satisfied?
* Evaluates the satisfaction or denial of goals given a functional or design alternative
* Values are propagated forward or backward throughout the model
* Qualitative or quantitative approaches
* Techniques take different approaches to resolving multiple values for incoming goals:
  + Adding evidence, combine using probabilistic rules, separate evidence, fixed rules, human judgment

**Metrics**

* Example Analysis Questions:
  + How secure is the system represented by the model?
  + How risky is a particular alternative for a stakeholder?
* Structural properties of the model and construct classifications are used to calculate metrics
  + Example: counts of dependency classifications (instance, model, duplicate, hidden) in a Strategic Dependency (SD)
* Metrics often represent non-functional requirements
  + Examples: predictability, security, privacy, accuracy, etc.
* They can also represent model properties:
  + Examples: completeness, consistency and correctness
* Metrics can be local or global

**Planning**

* Example Analysis Questions:
  + What actions must be taken to satisfy goals?
  + What are the best plans according to certain criteria?
* Work has applied AI-type planning to find satisfactory sequences of actions in models
* Requires definition of axioms that express possible goal decompositions and delegations
  + Expresses the capabilities of actors in a model
* A planner finds a delegation of goals to actors which fulfills model goals
* Plans are evaluated by some criteria

**Simulation**

* Example Analysis Questions:
  + What happens when an alternative is selected?
  + Are there unexpected properties in a simulation?
* Adds temporal information including pre- and post- conditions to models
  + Translated to ConGolog (situation calculus) programs for simulation
* Extensions simulate confidence, trust and distrust

**Model Checking**

* Example Analysis Questions:
  + Is it possible to achieve a particular goal?
  + Is the model consistent?
* Models are expanded/converted to a temporal formalism
  + Includes expressions of creation, fulfillment and invariant properties
* First order temporal logic statements are used to represent desired constraints
* Model checker is used to validate properties and check for consistency
* Further work adds in checks for security and trust