**ActionGUI** is a domain-specific language for modeling data-centric web applications with fine-grained access control policies.

An ActionGUI model consists of three models: a data model, a security model, and a GUI model.

Object Constraint Language (OCL) is used in ActionGUI models to specify data invariants, authorization constraints, and action conditions.

ActionGUI models have a well-defined semantics amenable to formal analysis. Full data-centric web applications can be automatically generated from ActionGUI models.

**Data Model:** specifies the application domain (entities, attributes, associations, invariants).

**Security Model:** specifies the application access control policy (roles, permissions, constraints).

**GUI Model:** specifies the application GUI (widgets, events, actions).

**ActionGUI model properties**

Invariants preservation

For any possible sequence of action triggered by an event, if all the data model invariants are satisfied before the event, then they will be satisfied afterwards.

Security awareness

For each role, for any possible sequence of action triggered by an event, if all the data model invariants are satisfied before the event, then, for each action in the sequence, the authorization constraint will be satisfied before its execution is attempted.

**Checking ActionGUI model properties**

- **STEP 1:** We formalize in OCL the data actions' post-conditions
- **STEP 2:** We use OCL2FOL to map OCL into first-order logic
- **STEP 3:** We use SMT solvers to solve the resulting satisfiability problems

E.g., Is the sequence of actions triggered by clicking on the button NewEmployee "invariants preserving"?

E.g., Is the sequence of actions triggered by clicking on the button NewEmployee "security aware"?