OntoSoft

Software Stewardship for the Geosciences

www.ontosoft.org

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Problems Addressed

Today, most software developed by scientists is never shared

- There are repositories of model software (e.g., CSDMS), also code repositories (e.g., GitHub)
- However, software is rarely shared, particularly all the data pre-processing and visualization software.

Problem: Hard to build on other work, especially across disciplines

- Software captures valuable geoscience knowledge and should be shared
- "*Scientists and engineers spend more than 60% of their time just preparing the data for model input or data-model comparison*" (NASA A40)

Open science

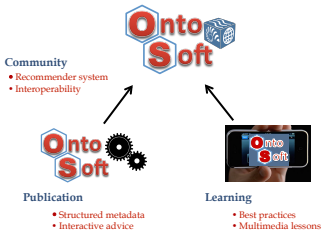
- Science products, including software, are of general societal importance [Holdren's OSTP memo, 2013] [NSF 2015]
- Reproducible science requires open software
- Open source software development is more sustainable

Scientists want to get credit for software much more than for data [Nature Metrics survey, 2010]

OntoSoft Project Goals

An on-line community for sharing knowledge about geosciences software

- Intelligent assistance to publish and describe new software: how to use it appropriately, what kinds of data, how it relates to other software, propagating provenance
- Recommender system and sophisticated search capabilities to find software that fits science needs
- Interactive advice on open source software, forming successful developer communities, and other software sharing topics



Novel research contributions

- An intelligent user interface that organizes the interaction in terms of science tasks (e.g., understand assumptions, do research with the software, cite the software, etc)
- An ontology to represent metadata for scientific software (http://www.ontosoft.org/software)
- Automated crawlers that extract metadata for the software from the user's web site (e.g., extracting license and other information from GitHub)
- Training modules to help scientists learn to share and describe software

Benefits

- Open science: Easy to disseminate models and software across disciplines
- Accelerate research: By reusing software
- Reproducibility: Easy to replicate results
- Accessibility: For non-programmers
- Quality: Best software that is well tested
- Integration: Well-described software is easier to integrate

OntoSoft: An Ontology for Software Metadata

Identify
Locate – unique identifier
has name (desc)
has short description (desc)
has software category (desc)
has unique ID (uniqueID)
has project web site (location+)

Understand
Relate – domain knowledge
has domain keywords (desc)
has uses and assumptions (desc)
has use limitations (desc)
similar software (desc)
Trust – quality and ratings
has creator (agent+)
has publisher (agent+)
has major contributor (agent+)
commitment of support (desc)
has adopters (entity+)
has use information (desc)
has use statistics (desc)
used in publication (citation+)
has benchmark information (desc)
has salient qualities (desc)
has funding sources (desc)
has rating (rating+)

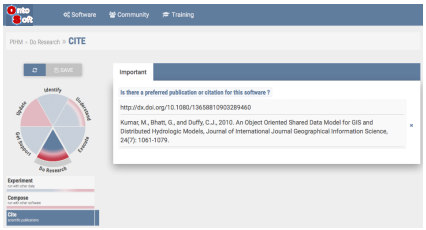
Do Research
Experiment – run with other data
has input (i-o)
has input parameter (i-o)
has output (i-o)
has relevant data sources (desc)
Compose – run with other software
has interoperable software (desc+)
has composition description (composition)
Cite – scientific publications
has preferred citation (citation+)

Execute
Access – download
has code location (location)
has executable location (location)
has license (license+)
Install – execution requirements
has documentation (location)
has installation instructions (desc)
has implementation language (language+)
has dependency (software version)
requires average memory (measurement)
supports operating system (os)
has average run time (desc)
has other implementation details (desc)
Run – testing execution
has test data (desc)
has test instructions (desc)

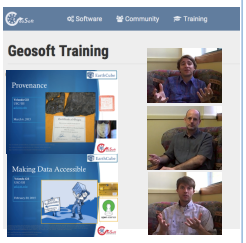
Get Support
Discuss – support and community
has email contact (email)
has software support (desc)

Update
Track – evolution
has software version (version)
has version release date (date)
supersedes (version)
superseded by (version)
Contribute – evolution
has active development (desc)
has software community (desc)

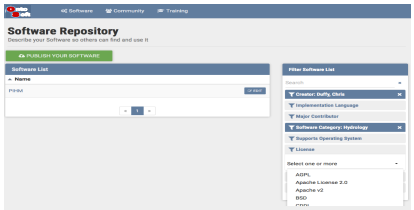
Publishing Software



Training



Finding and Reusing Software



Geoscience Papers of the Future