



**LUND**  
UNIVERSITY

# EDAP15: Program Analysis

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META-LANGUAGES

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# Meta-Languages

BNF

describing

AddPrint

```
Program ::= <Stmt>*
Stmt    ::= var id := <Expr> ;
        | print <Expr> ;
Expr    ::= <Expr> + <Expr>
        | numeral
        | id
```

JastAdd

describing

Teal

Meta-Language

Object Language

```
aspect NameAnalysis {
  /**
   * Get the function or variable name
   */
  syn String Decl.name() {
    return getIdDecl().getIdentifer();
  }

  // Look up the declaration matching an use.
  inh IdDecl IdUse.lookup(String s);
  syn IdDecl IdUse.lookup() = lookup(getIdentifer());
}
```

# Summary

- ▶ **Meta-Language** describes **Object Languages**
- ▶ **Meta-Variables** are variables in the meta-language
- ▶ Pitfall: Meta-variables can bind to object-language variables

Example:

- ▶ Object variable in the input program:

```
var x := 0;
```

- ▶ Meta-variable in the static analysis:

```
if (v.name == "x") {  
    print("Please use a more descriptive variable name");  
}
```