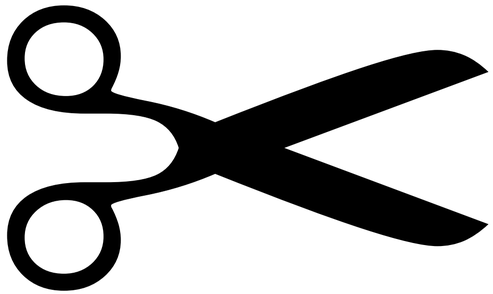
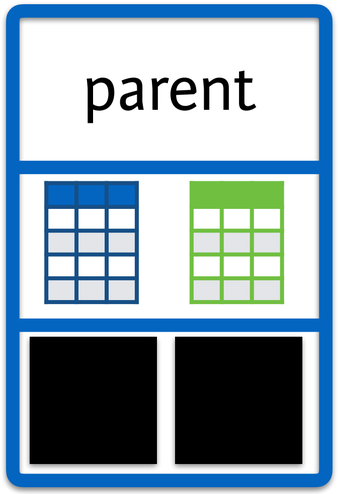
OBJECT-ORIENTED PROGRAMMING IN R: S3 & R6

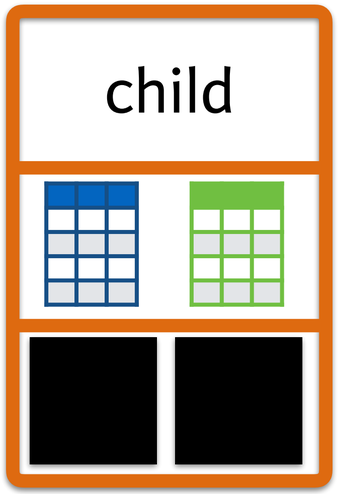
Propagating Functionality with Inheritance



```
thing_factory <- R6Class(
  "Thing",
  private = list(
    a_field = "a value",
    another_field = 123
  ),
  public = list(
    do_something = function(x, y, z) {
      # do something here
    }
  )
)
```

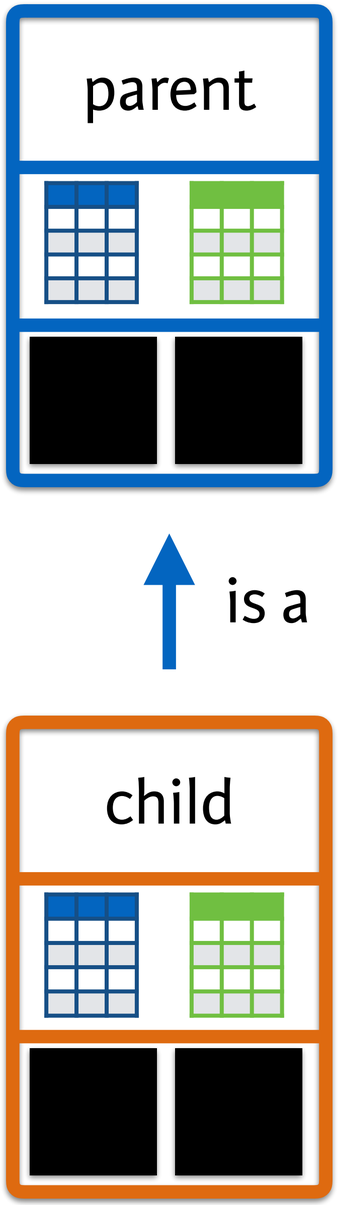


the class you inherit from



the class that inherits
fields and methods

```
child_thing_factory <- R6Class(
  "ChildThing",
  inherit = thing_factory,
  public = list(
    do_something_else = function() {
      # more functionality
    }
  )
)
```



- a fancy microwave **is a** microwave
- **not all** microwaves **are** fancy microwaves

```
> a_thing <- thing_factory$new()
```

```
> class(a_thing)
[1] "Thing" "R6"
> inherits(a_thing, "Thing")
[1] TRUE
> inherits(a_thing, "R6")
[1] TRUE
```

```
> a_child_thing <- child_thing_factory$new()
```

```
> class(a_child_thing)
[1] "ChildThing" "Thing"      "R6"
> inherits(a_child_thing, "ChildThing")
[1] TRUE
> inherits(a_child_thing, "Thing")
[1] TRUE
> inherits(a_child_thing, "R6")
[1] TRUE
```

Summary

- **Propagate functionality** using **inheritance**
- Use the **`inherit` arg** to `R6Class()`
- **Children get** their **parent**'s **functionality**
- ... but the **converse is not true**

OBJECT-ORIENTED PROGRAMMING IN R: S3 & R6

Let's practice!

Embrace, Extend, Override

```
thing_factory <- R6Class(
  "Thing",
  public = list(
    do_something = function() {
      message("the parent do_something method")
    }
  )
)
```

```
child_thing_factory <- R6Class(
  "ChildThing",
  inherit = thing_factory,
  public = list(
    do_something = function() {
      message("the child do_something method")
    },
    do_something_else = function() {
      message("the child do_something_else method")



    }
  )
)
```

```
> a_child_thing <- child_thing_factory$new()
```

```
> a_child_thing$do_something()
the child do_something method
```

`private$` accesses **private** fields

`self$` accesses **public** methods in **self**

`super$` accesses **public** methods in **parent**

```
child_thing_factory <- R6Class(
  "ChildThing",
  inherit = thing_factory,
  public = list(
    do_something = function() {
      message("the child do_something method")
    },
    do_something_else = function() {
      message("the child do_something_else method")
      self$do_something()
      super$do_something()
    }
  )
)
```

```
> a_child_thing <- child_thing_factory$new()
```

```
> a_child_thing$do_something_else()
the child do_something_else method
the child do_something method
the parent do_something method
```

Summary

- **Override** by giving the **same name**
- **Extend** by giving a **new name**
- `self$` accesses **public** methods in **self**
- `super$` accesses **public** methods in **parent**

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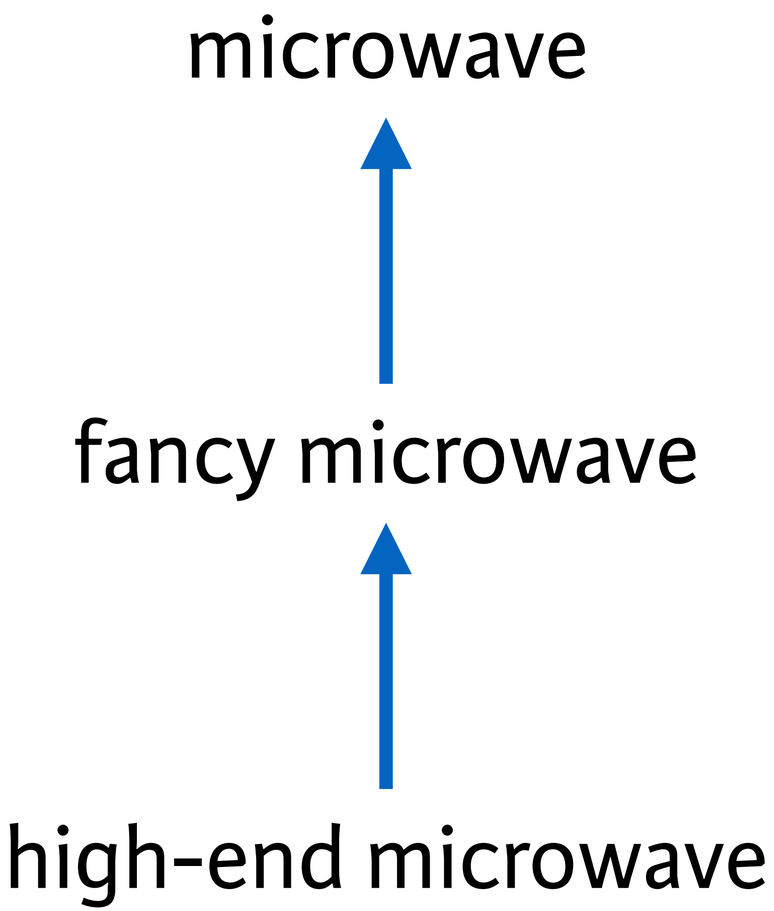
Let's practice!

OBJECT-ORIENTED PROGRAMMING IN R: S3 & R6

Multiple Levels of Inheritance


CLOCK
AM/PM
AUTO MITE LIGHT
TIMER
CONVENIENCE COOKING
POPCORN
REHEAT
BEVERAGE
COOK
POTATO
VEGETABLE
SNACKS
TIME COOK
DEFROST AUTO/TIME
REMINDER
HELP
DELAY START
START
CLEAR OFF
ADD 30 SEC.
SURFACE LIGHT
BEEPER VOLUME
TURNTABLE
VENT FAN


microwave
fancy microwave
high-end microwave

```
thing_factory <- R6Class(
  "Thing"
)
```

```
child_thing_factory <- R6Class(
  "ChildThing",
  inherit = thing_factory
)
```

```
grand_child_thing_factory <- R6Class(
  "GrandChildThing",
  inherit = child_thing_factory
)
```

```
thing_factory <- R6Class(
  "Thing",
  public = list(
    do_something = function() {
      message("the parent do_something method")
    }
  )
)
```

```
child_thing_factory <- R6Class(
  "ChildThing",
  inherit = thing_factory,
  public = list(
    do_something = function() {
      message("the child do_something method")
    }
  )
)
```

```
grand_child_thing_factory <- R6Class(
  "GrandChildThing",
  inherit = child_thing_factory,
  public = list(
    do_something = function() {
      message("the grand-child do_something method”)
      super$do_something()
      super$super$do_something()
    }
  )
)
```

```
> a_grand_child_thing <- grand_child_thing_factory$new()
> a_grand_child_thing$do_something()
the grand-child do_something method
the child do_something method
Error in a_grand_child_thing$do_something(): attempt to
apply non-function
```

```
child_thing_factory <- R6Class(
  "ChildThing",
  inherit = thing_factory,
  public = list(
    do_something = function() {
      message("the child do_something method")
    }
  ),
  active = list(
    super_ = function() super
  )
)
```

```
grand_child_thing_factory <- R6Class(
  "GrandChildThing",
  inherit = child_thing_factory,
  public = list(
    do_something = function() {
      message("the grand-child do_something method")
      super$do_something()
      super$super_$do_something()
    }
  )
)
```

```
> a_grand_child_thing <- grand_child_thing_factory$new()
> a_grand_child_thing$do_something()
the grand-child do_something method
the child do_something method
the parent do_something method
```

Summary

- R6 objects can only **access their direct parent**
- **Intermediate** classes can **expose their parent**
- Use an **active binding** named **`super_`**
- **`super_`** should simply **return `super`**

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Let's practice!