

# design and analysis of ecological experiments: a bestiary of experimental and sampling designs

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BIOL322: experimental field ecology  
29 may 2013

# outline

- continuity of variables
- dependency of variables
- classes of experimental design

# continuity of variables



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  - categorical, nominal with no apparent ranking

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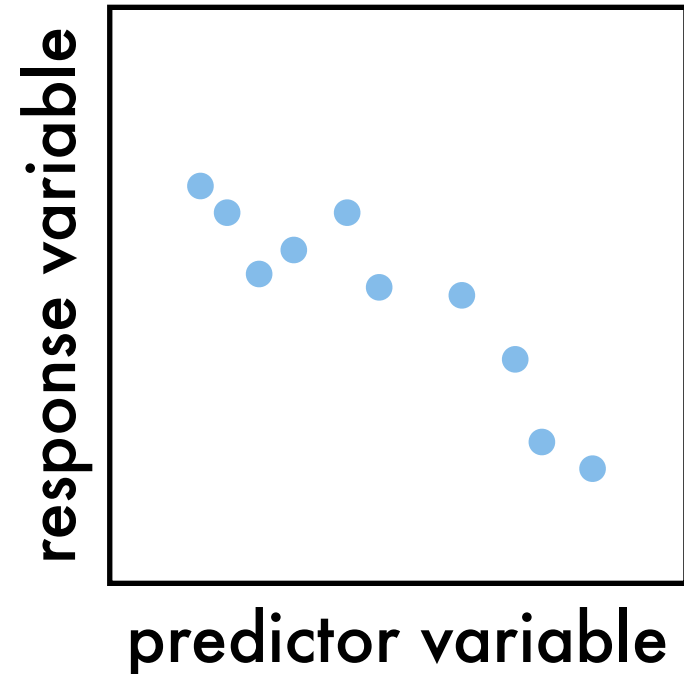
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continuous	regression	
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# regression: types

- simple regression  $Y = \beta X$
- multiple regression  $Y = \beta_1 X_1 + \beta_2 X_2 \dots$
- multivariate regression  $[Y_1 \dots Y_p] = [\beta_1 X_1 \dots \beta_p X_q]$

# simple regression I

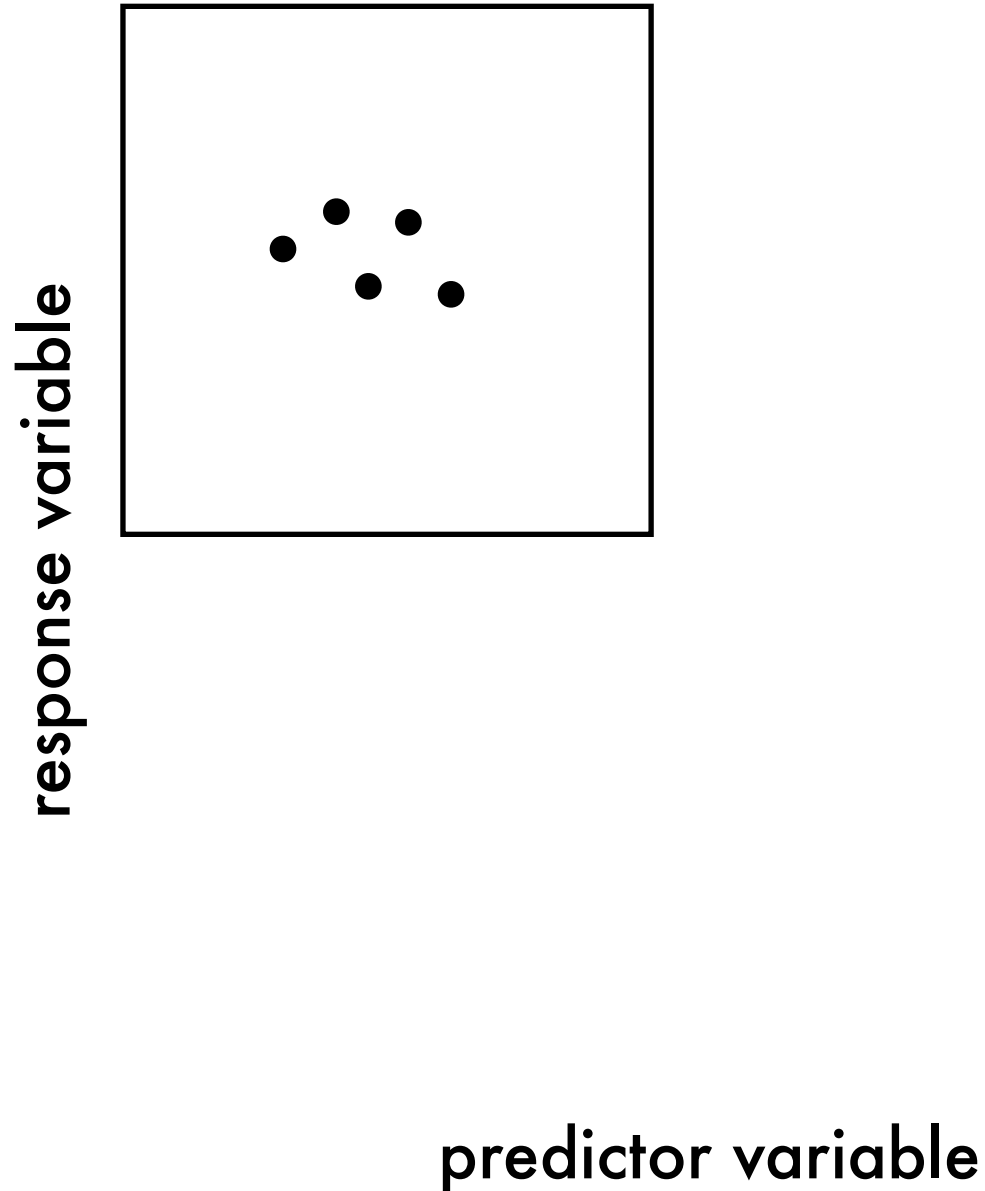
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- distribution of predictor is uniform . . . ish

response variable

predictor variable

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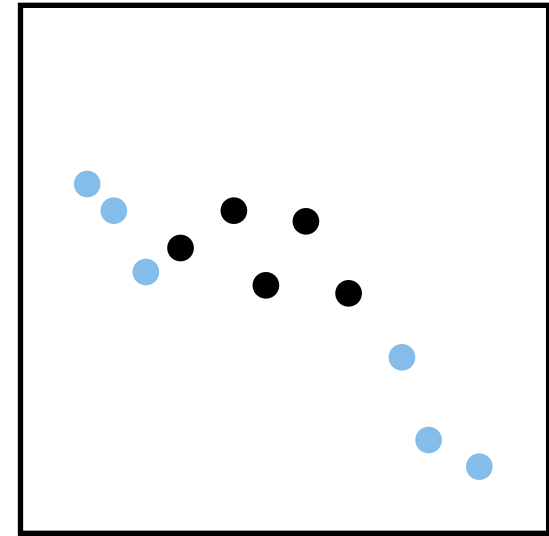
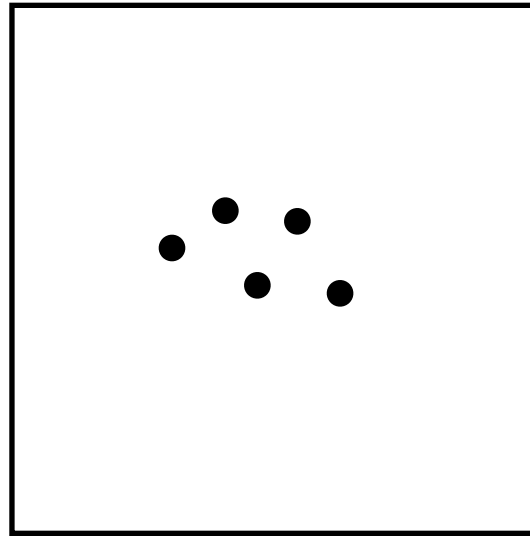
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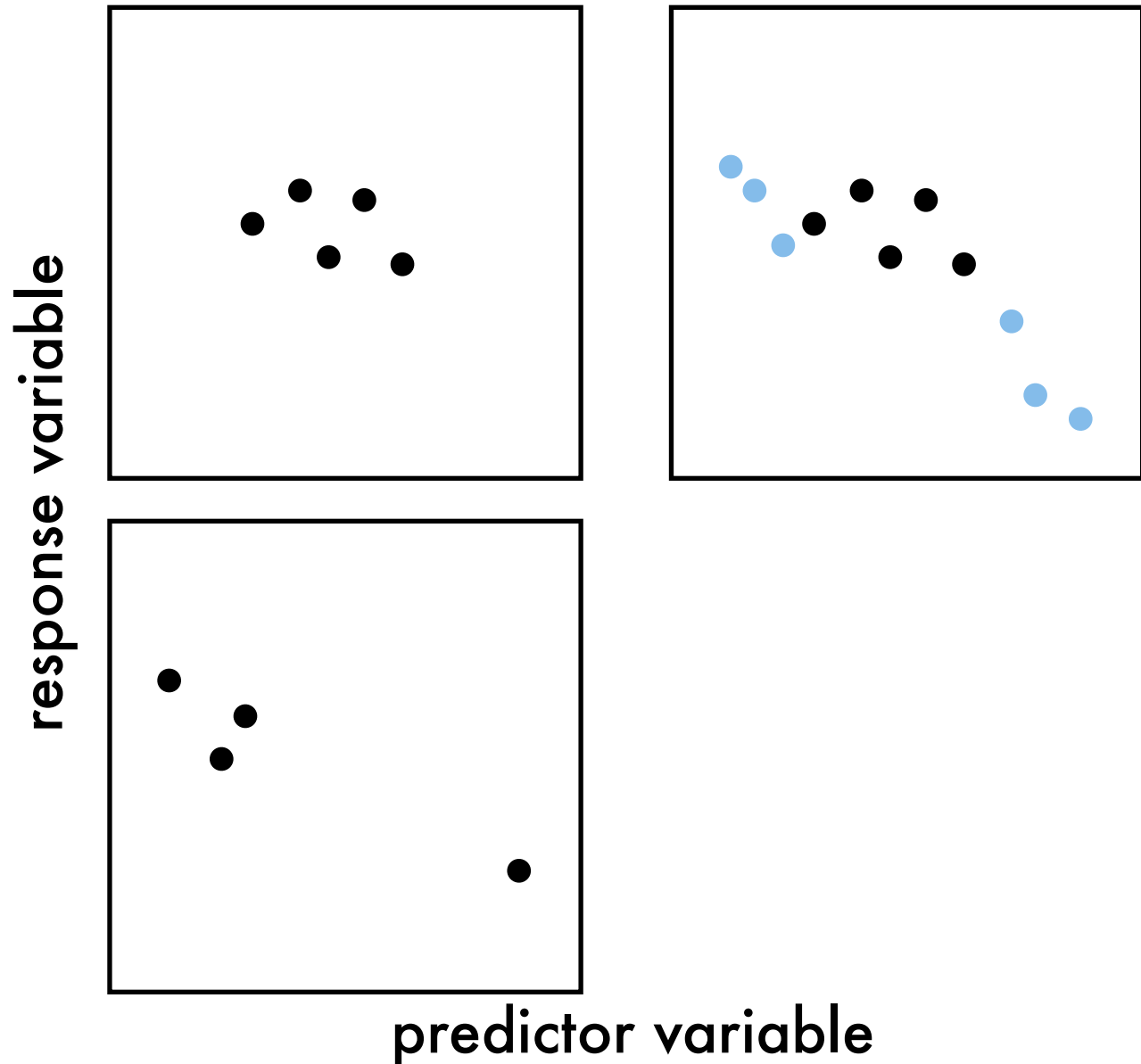
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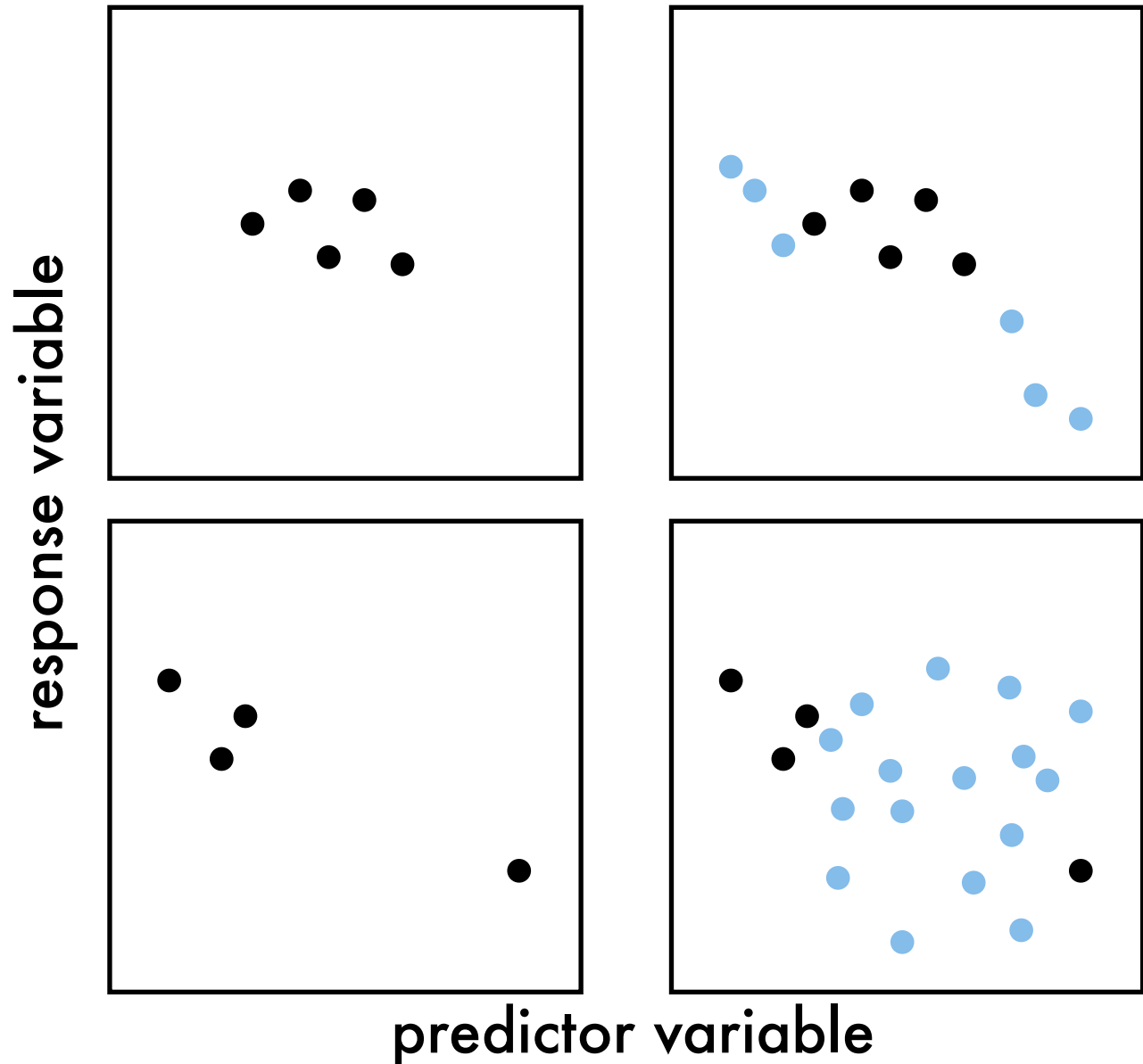
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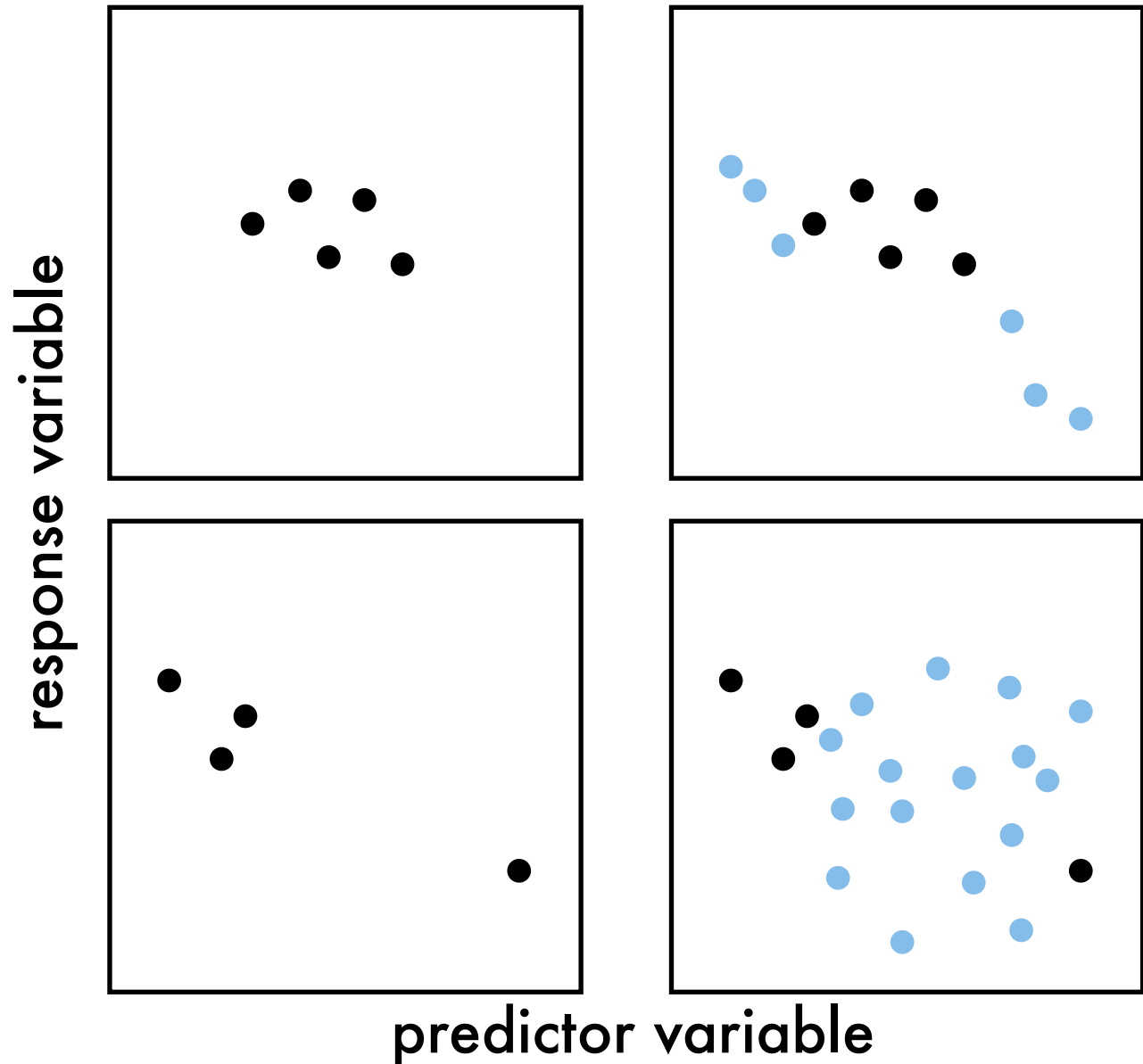
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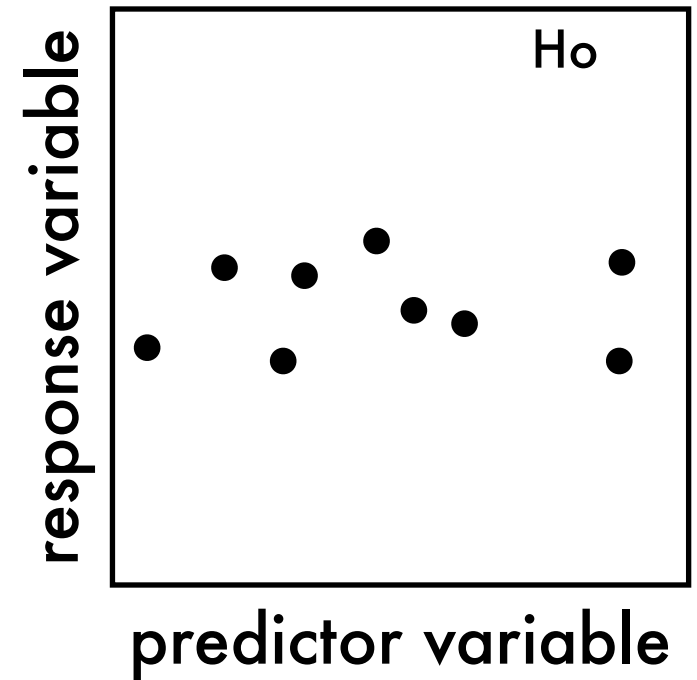
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$$H_0 = Y = \beta_0 + \varepsilon$$



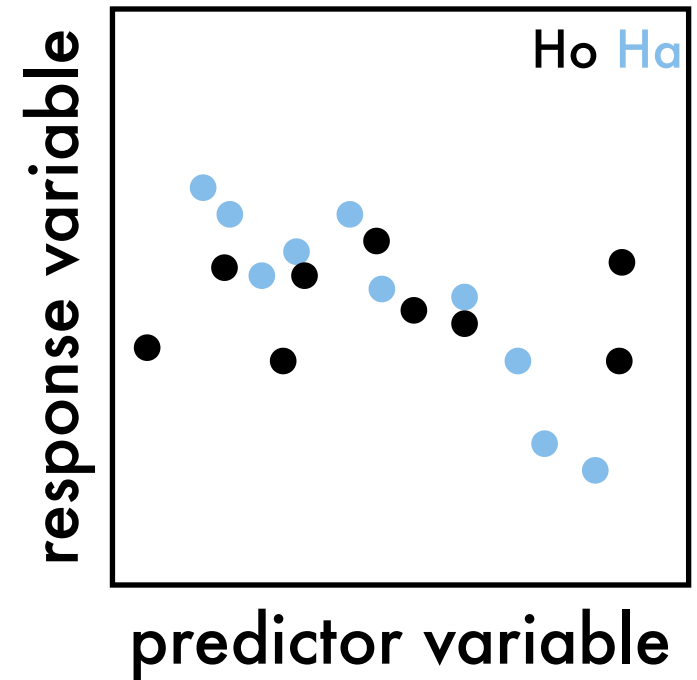
# simple regression II

- statistical test
- null hypothesis:

$$H_o = Y = \beta_o + \varepsilon$$

- alternative hypothesis:

$$H_a = Y = \beta_o + \beta_1 X + \varepsilon$$

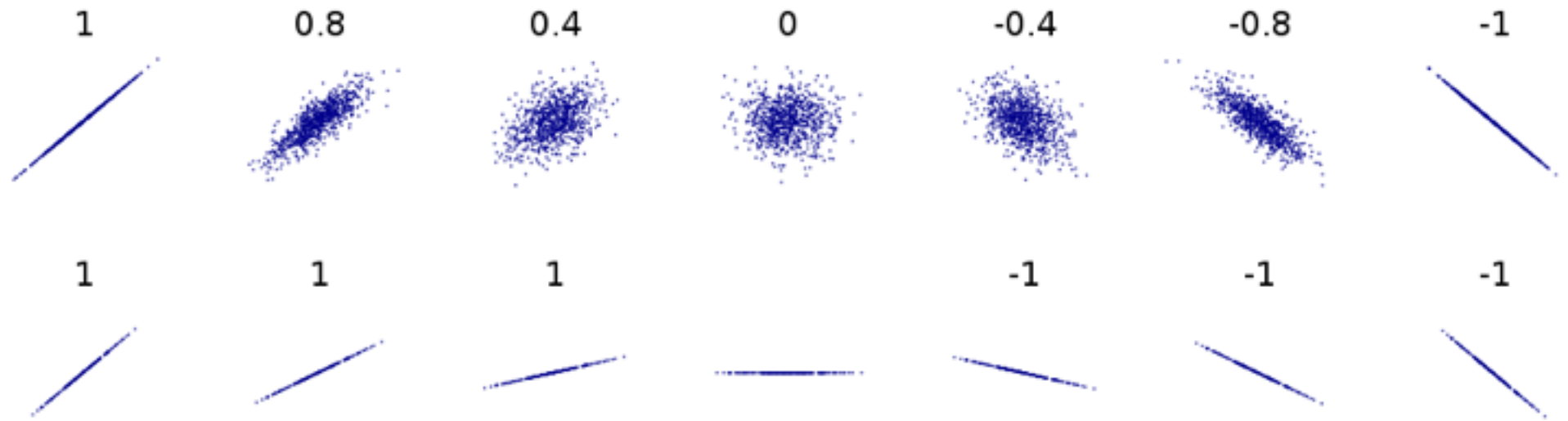


# simple regression III

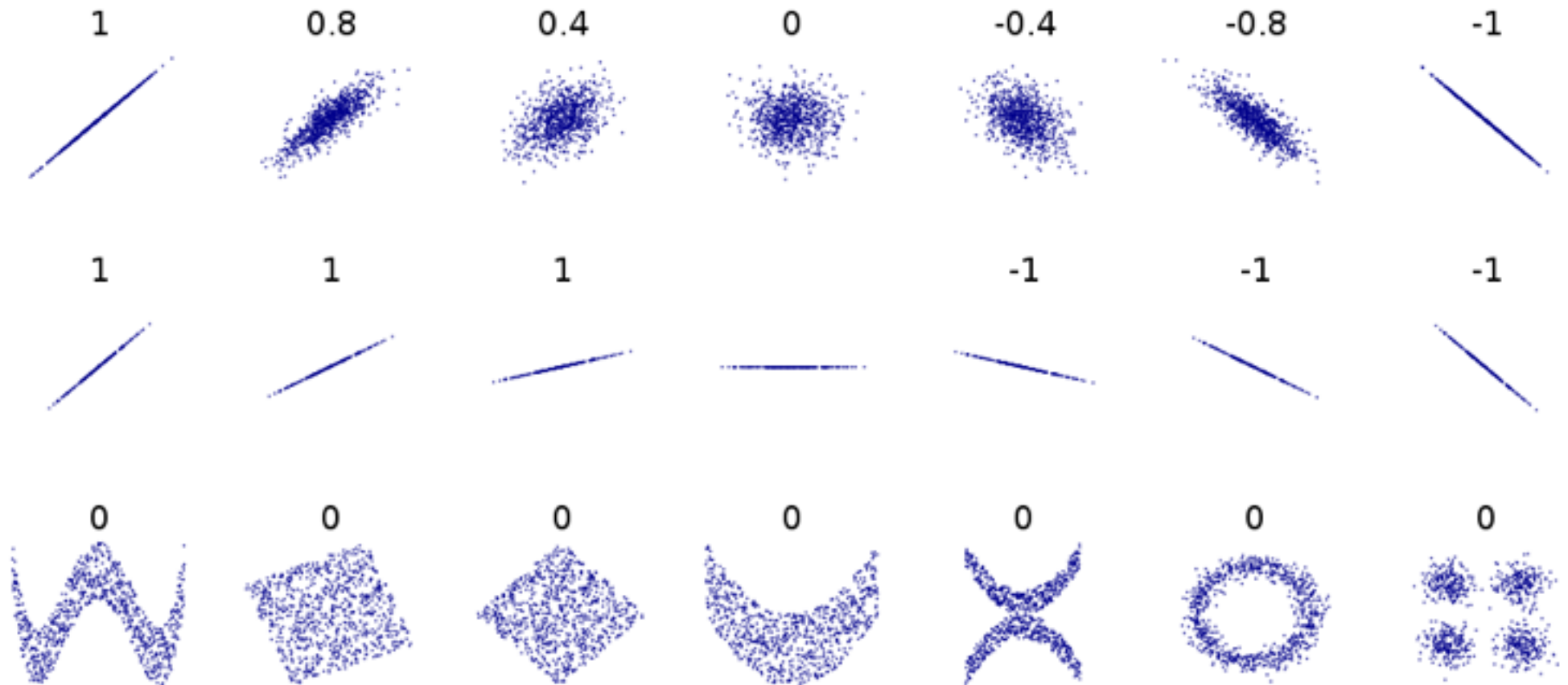
# simple regression III



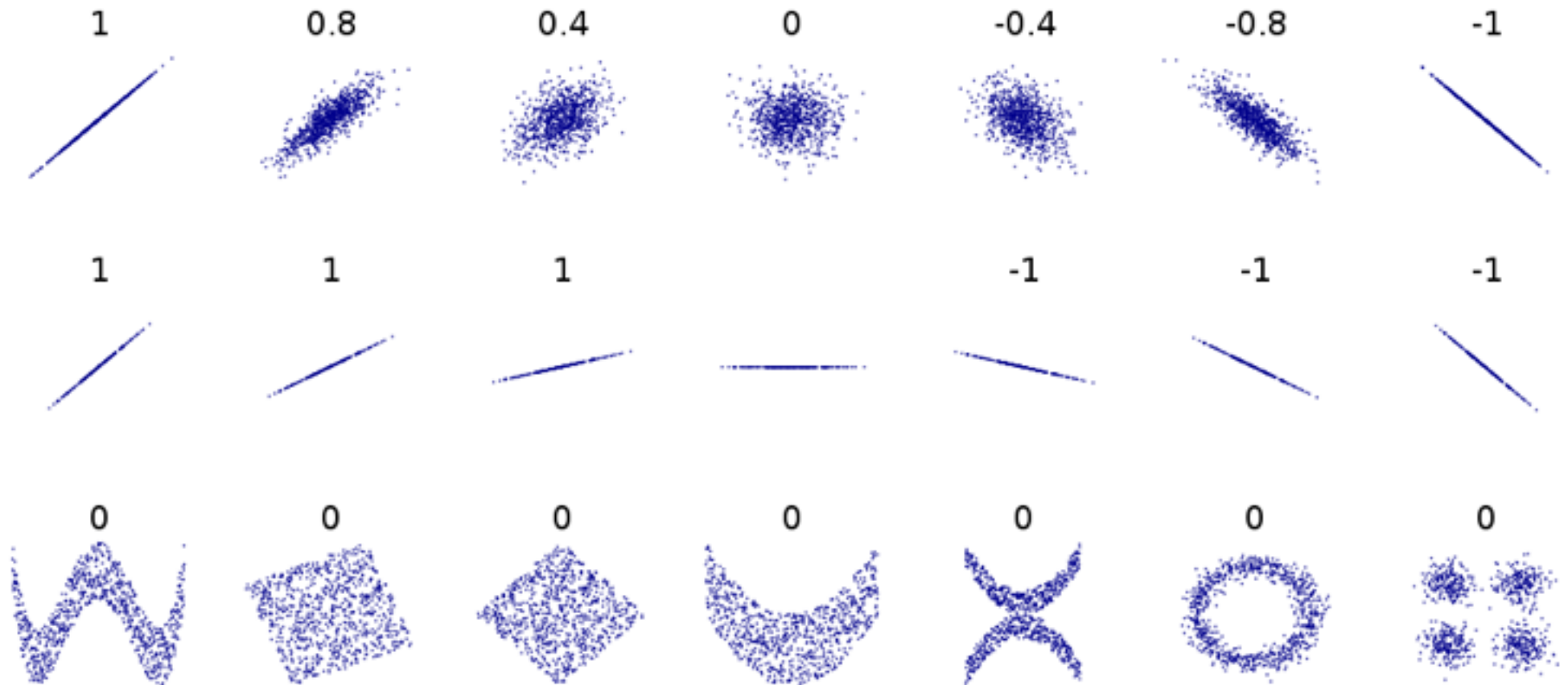
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# classes of design

independent variable

dependent variable

	continuous	categorical
continuous	regression	ANOVA
categorical	logistic regression	tabular

# logistic regression

- special case of regression where dependent variable is categorical
- same statistical hypotheses, but equation reads:

$$H_a = \ln \left( \frac{p}{1-p} \right) = \beta_0 + \beta_1 X + \varepsilon$$

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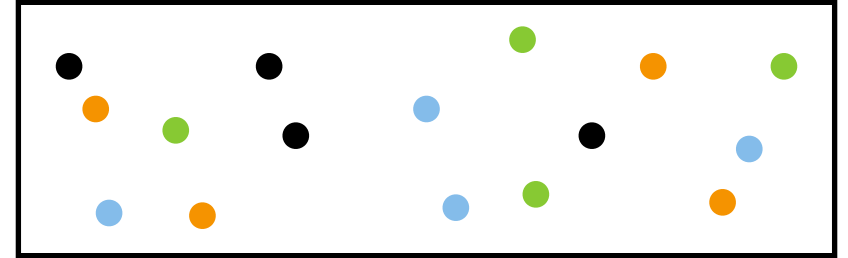
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  - **interaction effect:** synergistic / multiplicative responses to treatments

# ANOVA: types

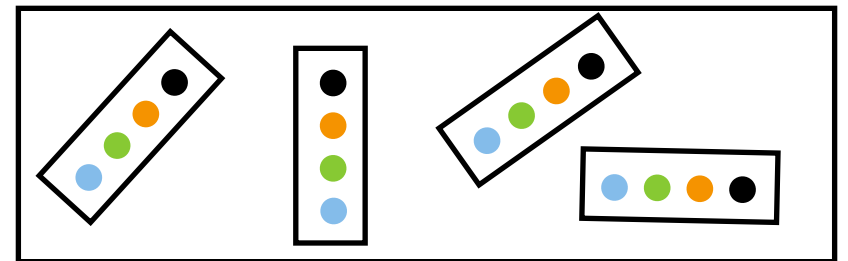
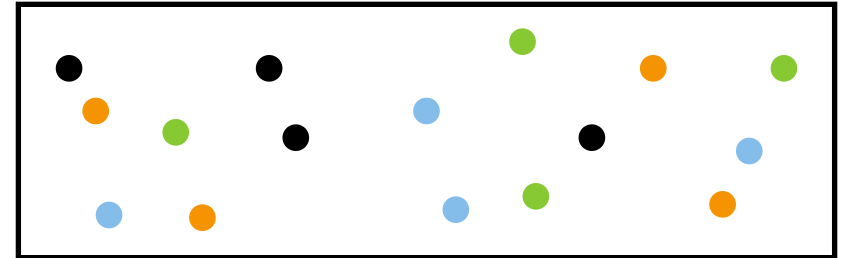
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- single-factor ANOVA



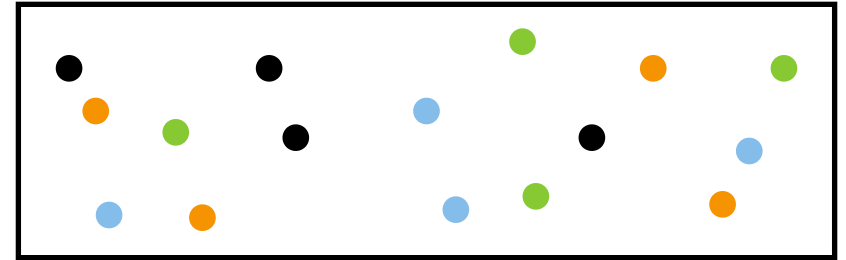
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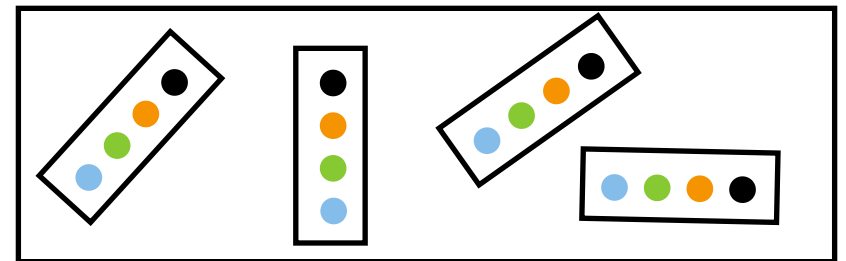


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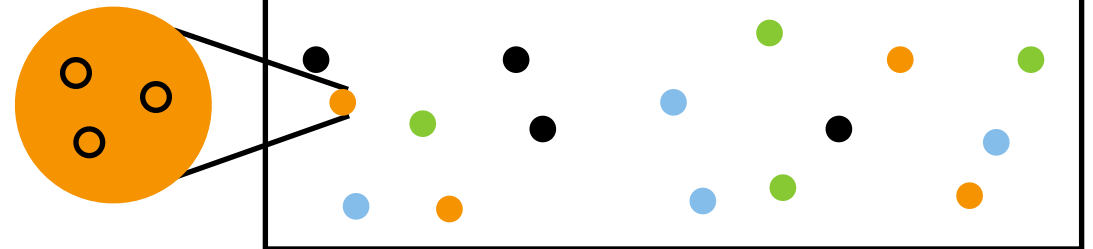
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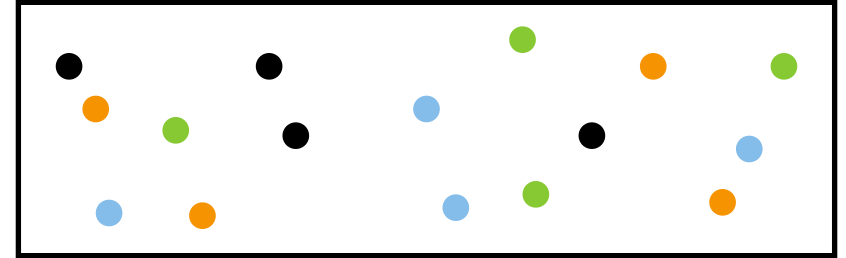


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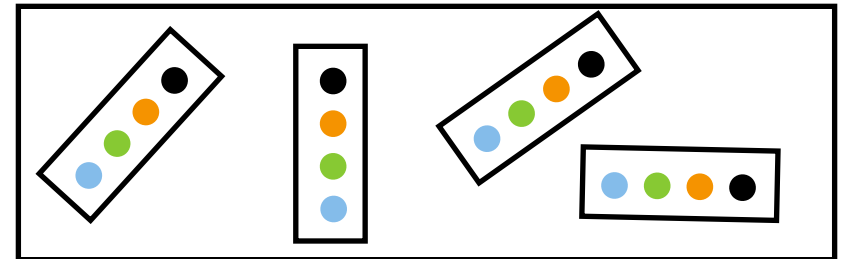


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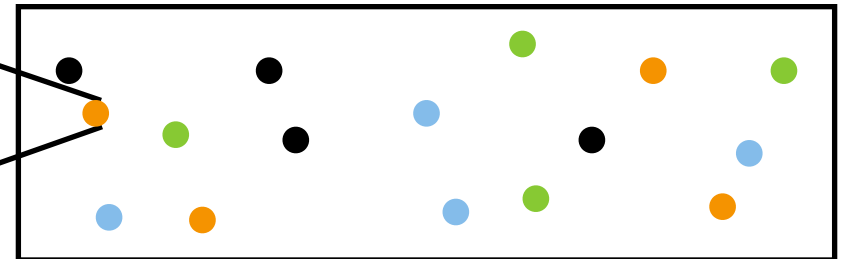
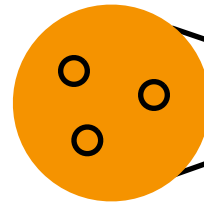
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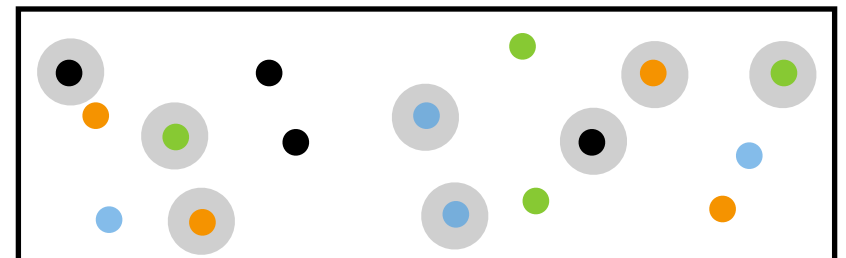
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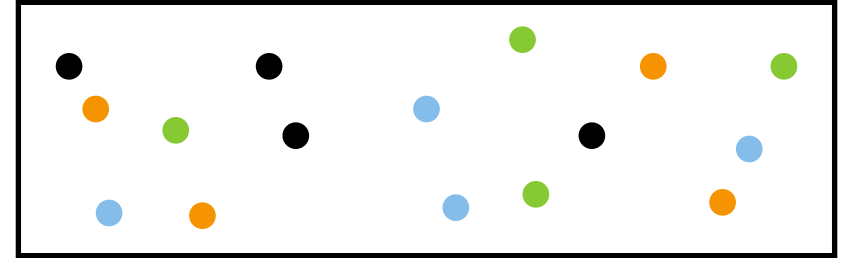
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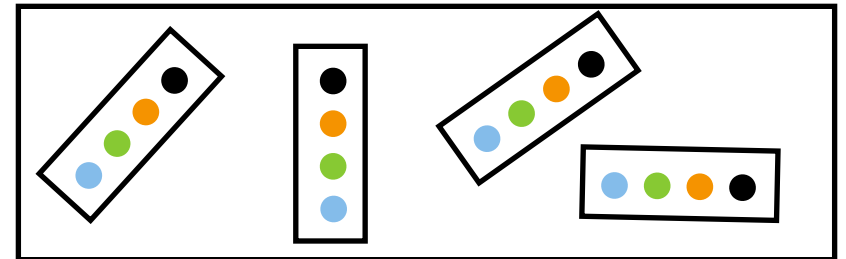


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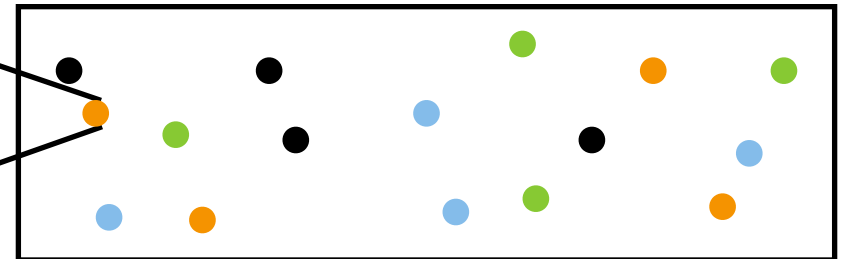
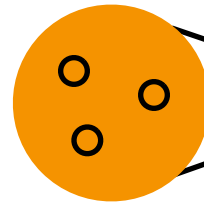
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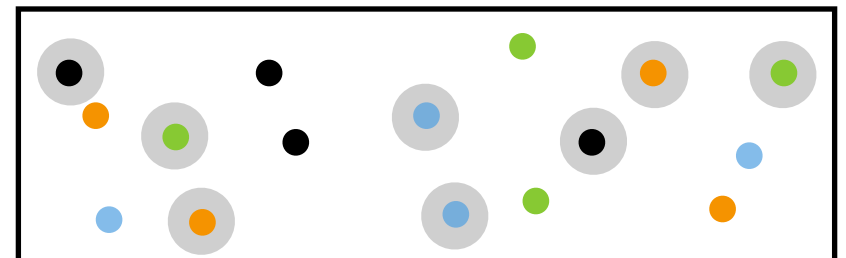
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- remember the KISS principle:
  - **Keep It Simple, Stupid**