Components of learning

**Metaphor:** Credit approval

**Applicant information:**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>age</td>
<td>23 years</td>
</tr>
<tr>
<td>gender</td>
<td>male</td>
</tr>
<tr>
<td>annual salary</td>
<td>$30,000</td>
</tr>
<tr>
<td>years in residence</td>
<td>1 year</td>
</tr>
<tr>
<td>years in job</td>
<td>1 year</td>
</tr>
<tr>
<td>current debt</td>
<td>$15,000</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
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</tbody>
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Approve credit?
Components of learning

Formalization:

- **Input**: $\mathbf{x}$  \textit{(customer application)}
- **Output**: $y$  \textit{(good/bad customer?)}
- **Target function**: $f : \mathcal{X} \rightarrow \mathcal{Y}$ \textit{(ideal credit approval formula)}
- **Data**: $(\mathbf{x}_1, y_1), (\mathbf{x}_2, y_2), \cdots, (\mathbf{x}_N, y_N)$ \textit{(historical records)}
- **Hypothesis**: $g : \mathcal{X} \rightarrow \mathcal{Y}$ \textit{(formula to be used)}
UNKNOWN TARGET FUNCTION
\( f : X \rightarrow Y \)
(ideal credit approval function)

TRAINING EXAMPLES
\((x_1, y_1), \ldots, (x_N, y_N)\)
(historical records of credit customers)

HYPOTHESIS SET
\( \mathcal{H} \)
(set of candidate formulas)

LEARNING ALGORITHM
\( A \)

FINAL HYPOTHESIS
\( g \approx f \)
(final credit approval formula)
The 2 solution components of the learning problem:

- **The Hypothesis Set**
  \[ \mathcal{H} = \{h\} \quad g \in \mathcal{H} \]

- **The Learning Algorithm**

Together, they are referred to as the *learning model*. 