Example

\[ \Sigma = \{a_1, a_2, \ldots, a_n\}, \quad n \geq 2 \]

\[ L = \{ \omega : \exists a_i \in \Sigma, \quad a_i \notin \{\omega\} \} \]

(\( a_i \) does not appear in \( \omega \))

AT LEAST ONE LETTER IS MISSING.

\( n = 4 \) eeL, a1eL, a2eL, a3eL, a4eL

\( a_1, a_2, a_3, a_4, L \)

\( a_3a_2a_1a_4a_1a_2 \in L \)

FIND NFA \( M \), such that \( M = L(M) \)

for \( n = 3 \)

AT LEAST

\[ \begin{align*}
& a_1 \text{ missing in } \omega \\
& \text{all } w \text{ with } a_3 \text{ missing} \\
& \text{all } w \text{ with } a_2 \text{ missing}
\end{align*} \]
$n = 4$ - the same idea! At least!

- $a_1$ missing
- $a_2$ missing
- $a_3$ missing

$e \in E(N)$

**General:**

$n \geq 2$

$M = (K, \Sigma, \Delta, s, F)$

$K = \{ q_0 = s, q_1 \} \ldots q_n \in S$, $F = K - \{ q_0 \}$

$\Delta = \bigcup_{i=0}^{n} \{ (q_0, e, q_i) \} \cup \bigcup_{i,j=1, i \neq j} \{ (q_i, a_j, q_i) : i \neq j \}$

In state $q_i$, $a_j$ missing
\[ M_1 \equiv M_2 \text{ if } L(M_1) = L(M_2) \]

**Goal.**

We are going to prove:

**Fact 2**

For any NDFA \( M \) there is a DFA \( M' \) such that

\[ L(M) = L(M') \]

i.e. \( M \equiv M' \)

**Fact 1** means

\[ \text{DFA} \preceq \text{NDFA} \]

**Fact 2:**

\[ \text{NDFA} \preceq \text{DFA} \]
We will talk about
finite automata
i.e. deterministic
vs non-deterministic
Next goal:

FINITE AUTOMATA

≡ Regular languages

1. Any FA produces a regular expression
2. For any regular lang \( L \), there is a FA such that \( L = L(M) \)

Def: \( L \) is REGULAR if

\[ L = \Sigma(E) \] E-regular expression