

# COMP30026 Models of Computation Assignment 2

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## Challenge 4

- a. Let  $D$  be a DFA  $(Q, \Sigma, \delta, q_0, F)$  that recognises a regular language  $R$ . We can transform  $D$  into an NFA  $N$  that recognises  $drop(\mathbf{a}, R)$  by replacing every transition involving the symbol  $\mathbf{a}$  with an epsilon transition.

More formally, we can define  $N$  to be the five-tuple  $N = (Q, \Sigma_\epsilon \setminus \{\mathbf{a}\}, \delta', q_0, F)$  with the transition function,

$$\delta'(q, x) = \begin{cases} \{\delta(q, x)\} & \text{if } q \in Q \text{ and } x \in \Sigma \setminus \{\mathbf{a}\} \\ \{\delta(q, \mathbf{a})\} & \text{if } q \in Q \text{ and } x = \epsilon \end{cases}$$

Hence, since  $drop(\mathbf{a}, R)$  can be recognised by NFA  $N$ , then  $drop(\mathbf{a}, R)$  is also a regular language.

- b.  $L = \{a^m b^n c^n \mid m, n \geq 0\}$

## Challenge 5

## Challenge 6