Multiplicative-weights Algorithm (MW)

[with Freund]

- choose $\eta > 0$
- initialize: $\mathbf{P}_1 =$ uniform
- on round t:

$$\mathbf{P}_{t+1}(i) = \frac{\mathbf{P}_t(i) \, \exp\left(-\eta \, \mathbf{M}(i, \mathbf{Q}_t)\right)}{\text{normalization}}$$

- idea: decrease weight of strategies suffering the most loss
- directly generalizes [Littlestone & Warmuth]
- other algorithms:
    - [Hannan'57]
    - [Blackwell'56]
    - [Foster & Vohra]
    - [Fudenberg & Levine]
    ⋮