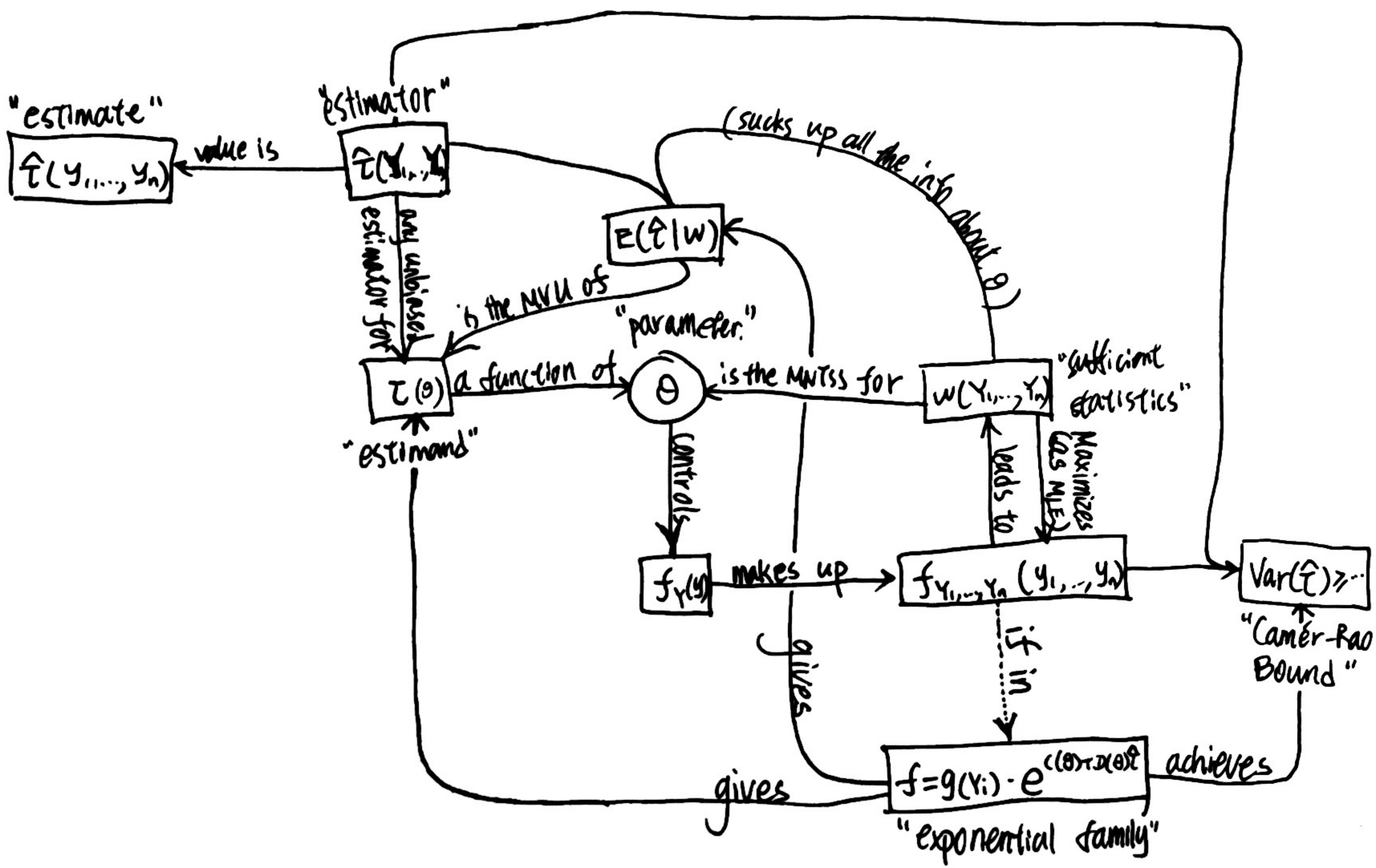

"estimate"
$\hat{\tau}(y_1, \ldots, y_n)$
value is
"estimator"
$\hat{\tau}(Y_1, \ldots, Y_n)$
estimator for
any unbiased
$E(\hat{\tau}|W)$
is the MVU of
(sucks up all the info about θ)
"parameter"
$\tau(\theta)$
a function of
θ
is the MNTSS for
$W(Y_1, \ldots, Y_n)$
"sufficient statistics"
"estimand"
controls
leads to
Maximizes (as MLE)
$f_Y(y)$
makes up
$f_{Y_1, \ldots, Y_n}(y_1, \ldots, y_n)$
$Var(\hat{\tau}) \geq \cdots$
"Camér-Rao Bound"
if in
gives
gives
$f = g(Y_i) \cdot e^{c(\theta) + D(\theta) t}$
achieves
"exponential family"

- Transformat. Theory
  - one RV case
    - Know X. $Y=g(X)$ is monotonic
      - $f_Y(y) = [f_X(x)|\frac{dx}{dy}|]_{x=g^{-1}(y)}$
      - $f_Y(y) = [f_X(x)\frac{1}{|\frac{dy}{dx}|}]_{x=g^{-1}(y)}$
    - many monotonic regions $f_Y(y) = \sum_{i \in region}[f_X(x)|\frac{dx}{dy}|]_{x_i=x_i^{-1}(y)}$
  - multiple transformat.
    - $f_{Y_1,Y_2}(y_1,y_2) = [f_{X_1,X_2}(x_1,x_2)\cdot|J|]_{x_1=x_1(y_1,y_2),\ x_2=x_2(y_1,y_2)}$
    - $f_{Y_1,Y_2}(y_1,y_2) = [f_{X_1,X_2}(x_1,x_2)\cdot\frac{1}{|J^*|}]_{x_1=x_1(y_1,y_2),\ x_2=x_2(y_1,y_2)}$
    - $J = \begin{vmatrix} \frac{\partial x_1}{\partial y_1} & \frac{\partial x_1}{\partial y_2} \\ \frac{\partial x_2}{\partial y_1} & \frac{\partial x_2}{\partial y_2} \end{vmatrix}$
    - $J^* = \begin{vmatrix} \frac{\partial y_1}{\partial x_1} & \frac{\partial y_1}{\partial x_2} \\ \frac{\partial y_2}{\partial x_1} & \frac{\partial y_2}{\partial x_2} \end{vmatrix}$
    - technique of using dummy
  - density funcs.
    - PDF
    - JDF
  - order statistics

- Estimation
  - ~~Case of many params~~
  - Case of many params
  - Finding the MVU estimator of (func of) a param. of a dist.
    - approach 1: Cramer-Rao
      - requires $f_{Y_1,\dots,Y_n}$ to be in exp. family expression and special cases
      - requirs support to depend on θ
      - getting estimand
        - → PDF
    - Approach 2: Sufficient Stat.
      - definition — factorization-based expression
      - NOT unique: any one-to-one mapping on SS is also SS
      - MNTSS
        - what is
          - minimality
          - non-triviality
        - how to find
          - factorization + len(SS) should < n
          - Smith-Jones: simplify R
          - when support is indep. of θ
            - exponential family
        - From MNTSS to MVU estimator (Rao-Blackwell theorem) $E(\hat{\tau}|W)$
          - manipulate W only till mean is unbiased
          - from any unbiased estimator calc. the cond. prob.
        - how to find when support does depend on θ
          - when $Y \in [A(\theta), B]$: $Y_{(1)}$
          - when $Y \in [A, B(\theta)]$: $Y_{(n)}$
          - when $Y \in [A(\theta), B(\theta)]$: difficult
    - Approach 3: Max-likelihood Theorem
      - The form of θ that maximizes $\log f_{Y_1,\dots,Y_n}(y_1,\dots,y_n;\theta)$.
      - Asymptotic Results
        - asymptotically unbiased
        - asymptotically normal dist'ed
        - asymptotically attaining CR Bound
      - relation to sufficient statistics
        - MLE IS SS!