

↓ \leftarrow linear, then flat (linear)

Can we fit that composite function using polyfit? \Rightarrow No!

\hookrightarrow will need a more complex fitting tool \Rightarrow Nonfit

Review: "Polyfit Recipe"

$p = \text{polyfit}(x\text{-in}, y\text{-in}, R)$

\uparrow inputs \uparrow degree, or
output polynomial
of length $(n+1)$

Uniquely!

\Rightarrow "Best fits" data via least-squares

\Rightarrow Typically linear: $p = \text{polyfit}(x, y, 1)$

$\hookrightarrow g = p(1)*x + p(2)$

\hookrightarrow Can fit anything in $y = mx + b$ form

\hookrightarrow e.g., exp, log, powers, recip...

\hookrightarrow How about sine waves? No. Comp fns \Rightarrow No. T5

Nlinfit "overview" / Philosophy

- Given non-linearizable (x_{in}, y_{in})

↳ No $y = mx + b$ form possible

- Nlinfit:

array-out = nlinfit (x_{in}, y_{in} , my-smart-UDF, array-in)

like polyfit

different!

just "n" in polyfit

Here: my-smart-udf = a self-defined function that I think fits the data

Must have this structure:

my-smart-udf = $\text{@}(\text{array}, x)$

$(\text{array}(1) * x^3 + \text{array}(2)) * (x < \text{array}(3)) +$

$\text{array}(4) * (x \geq \text{array}(3))$

$$\text{array-in} = [1 \ 2 \ 7 \ -19]$$

~~starting guess(es) for array values!~~
best fit

\Rightarrow Nlfit takes my-smartudf
& feeds into it: array-in & x-in

- i) $\xrightarrow{\text{runs}}$ smart-udf (array-in, x-in)
 - ii) $\xrightarrow{\text{generating y-l-udf}}$
 - iii) Calculates: $\frac{\text{sum}((y\text{-udf} - y\text{-in})^2)}{\text{SSR}}$
 - iv) Varies array-in values
until it finds lowest SSR
possible
 - v) Outputs "best fit" array values
to array-out
- $\xrightarrow{\text{Solution depends on ODF & array-in!}}$ *Not Unique!*

Nlinfit "Recpl"

1) load data $\rightarrow (x_{in}, y_{in})$

2) define UDF

$\text{smart-afunc} = @(\text{coeffs}, x) \dots$
 $\text{coeffs}(1) * \dots + \text{coeffs}(3) * x^3$

3) "Guess" at coeffs:

$\text{coeffs_in} = [1 \ -1 \ 4];$

4) Nlinfit:

$\text{coeffs_out} = \text{nlinfit}(x_{in}, y_{in}, \text{smart-afunc}, \dots, \text{coeffs_in});$

5) Overplot nlinfit:

$x_{smooth} = [\min(x_{in}) : 0.0 \dots 1 : \max(x_{in})];$

$y_{smooth} = \text{smart-afunc}(\text{coeffs_out}, x_{smooth}, \dots)$

$\text{plot}(x_{in}, y_{in}, \dots)$

$\text{plot}(x_{smooth}, y_{smooth}, \dots)$

⇒ Ex-Nifit.m

↳ Do it!

⇒ MOR-Coupt.m

↳ pseudocode only

MOR- Flattening Slides

Depth formula of Composite fn:

$$\text{Depth} = (A * t^{1/2} + B) * (t < t_{\text{break}})$$

$$+ (C * (t - t_{\text{break}}) + D) * (t \geq t_{\text{break}})$$

Why! "Shifts new line to start at t_{break} ..."

D = last point in Y_2 curve!

$$= (A * t_{\text{break}}^{1/2} + B)$$

$$\text{Depth} = (A * t^{1/2} + B) * (t < t_{\text{break}}) +$$
$$(C * (t - t_{\text{break}}) + (A * t_{\text{break}}^{1/2} + B)) * (t \geq t_{\text{break}})$$