# APTB Flowchart
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Start

Read in model, TOAs, and command-line parameters

Calculate cluster numbers and score them

Start the first/next selected cluster

Are there any starting selected clusters remaining?

**Yes** → Add JUMPs to every cluster except the selected one. Each cluster gets its own JUMP

**No** → End

Begin small loop to set up the JUMPed model

Is this the third iteration of this loop?

Something is likely very wrong, but sometimes the model needs to be fit more than once to settle

**Yes** → Is the $\chi^2_\nu$ above 3?

**Yes** (to third iteration) → Is the $\chi^2_\nu$ above 3?

**No** → Phase connect each cluster within itself by applying phase wraps to individual TOAs

Fit model for F0, relevant binary parameters, and every JUMP

**No** → End small loop

Begin/continue main algorithm

Have all clusters been unJUMPed

**No** → Find the closest cluster to the unJUMPed cluster(s). Remove the JUMP from this cluster (and set the JUMP value in the model to 0)

Phase connect each cluster within itself by applying phase wraps to individual TOAs (this is redundant the first time)

Check for phase wraps?

**No** → A phase wrap of 0 is assumed

**Yes** → Begin phase wrap sequence

Sample the $\chi^2_\nu$ values for three different phase wraps

Calculate the phase wrap of the parabola's vertex defined by these samples

Calculate the $\chi^2_\nu$ of the two adjacent phase wraps

Do any of these 3 phase wraps give a $\chi^2_\nu$ less than the prune condition (default ~2)?

**Yes** → Find every phase wrap with a $\chi^2_\nu$ below the prune condition by decreasing the phase wrap from the vertex until $\chi^2_\nu$ exceeds the prune condition and then increasing the phase wrap from the veretx until $\chi^2_\nu$ also exceeds the prune condition

**No** → Is this the second iteration of the checking for phase wrap sequence?

**No** → Attempt F-tests on the model that was the current model before it was checked for phase wraps

**Yes** → Prune this branch

Each of these phase wraps is a separate branch, with the best to worst branch ranked based on low to high $\chi^2_\nu$

End phase wrap sequence

**Yes** (Have all clusters been unJUMPed) → Is the $\chi^2_\nu$ < 10?

**Yes** → Save this solution in a seperate folder

**No** → Are there other branches remaining?

**No** → End of this starting selected cluster. Start again on the next selected cluster. Line not drawn to other gray box to avoid clutter

**Yes** → Load in the next best model from a different branch

Fit for all active parameters

Do F-tests to determine if a parameter should be added. (default F-test limit is 0.005)

Load the best branch/model available