YOU DON'T NEED TO DETREND YOUR DATA

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Gaussian process

likelihood function

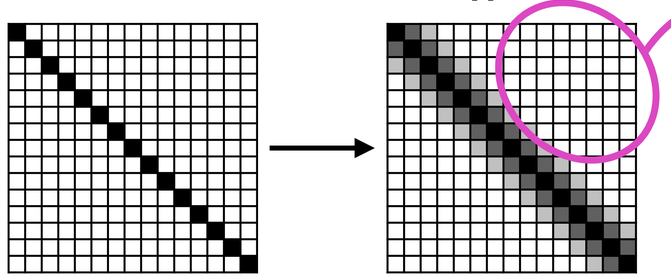
$$p(\text{data}\,|\,\text{model}) = \mathcal{N}[\boldsymbol{f};\, \boldsymbol{\mu}(\boldsymbol{\theta}),\, \Sigma(\boldsymbol{\alpha})]$$

observations *includes:*
"raw" photometry
auxiliary measurements (optional)

model *includes:*
physics (Kepler's equation, N-body, etc.)
geometry (limb darkening, etc.)

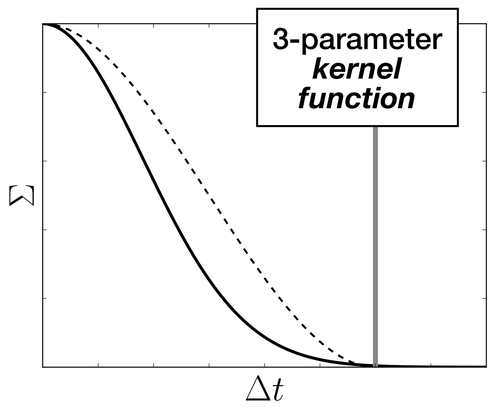
covariance *includes:*
observational uncertainties
systematics (trends, discontinuities, etc.)

a generalization of standard χ^2 likelihood



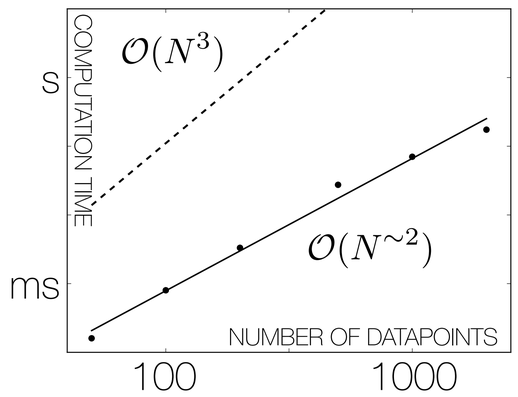
explicit **sparsity**

SuiteSparse[1]
state-of-the art sparse linear algebra

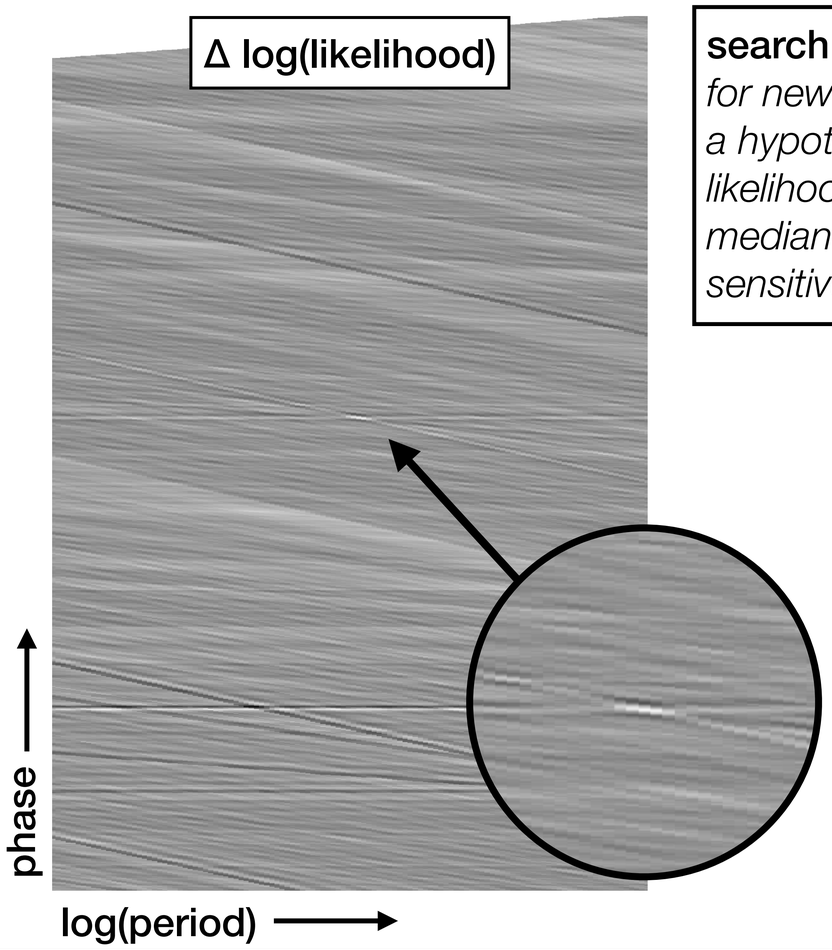


computationally ***tractable***

George[2]
an open source implementation
C (+Python bindings)



SEARCH

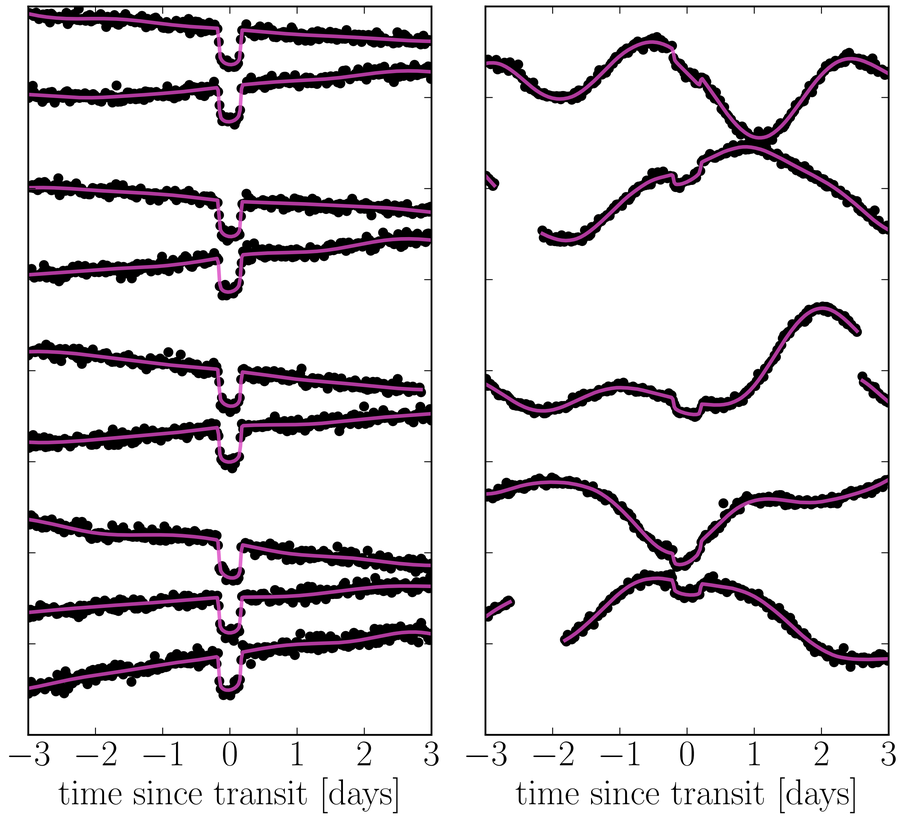


search *is the process of mining light curves for new candidates. Writing this question as a hypothesis test lets us incorporate a better likelihood function and search without median filtering the data. We find: Kepler is sensitive to Earth-analog transits!*

anywhere that one might use a χ^2 likelihood function, this Gaussian process is a ***drop-in replacement****. For* **characterizing** *planet candidates, all we need to do is trivially update the computation of the probability function in the MCMC loop. It's even easy to marginalize the kernel parameters!*

check out **code.dfm.io** *for open source code and demos*

CHARACTERIZATION



[1] cise.ufl.edu/research/sparse/SuiteSparse
[2] github.com/dfm/george