Parallel PySAL

Autoregression and Complex System Framework Integration

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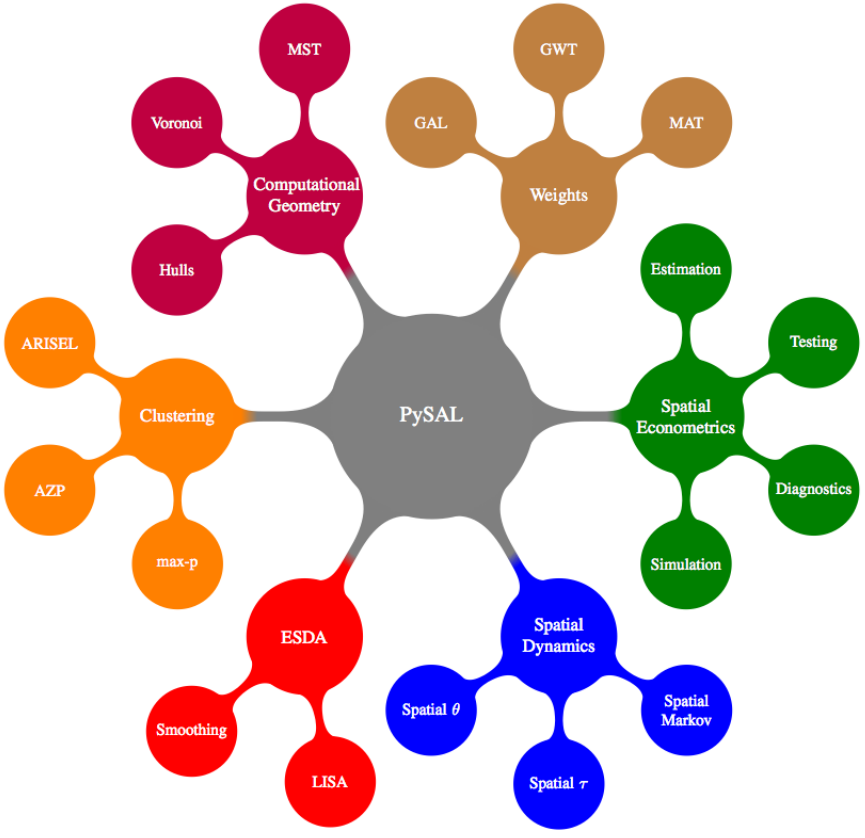
PySAL

Substantive Application: Spatial Econometrics

Implementation

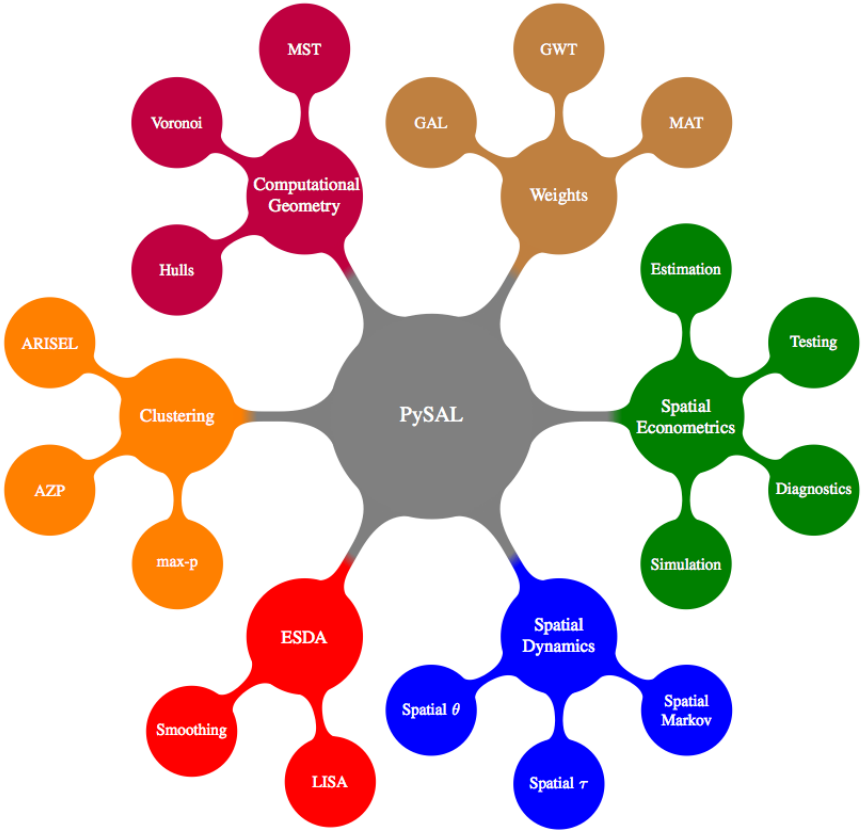
PySAL

- Spatial analysis library
- Big data world
- v 1.8 July 2014



pPySAL

- contiguity builder
- max-p region
- p-lisa
- fisher jenks
- spatial regimes



Lessons Learned

- Hardware dependence
- No holy grail of automatic parallelization
- Need a roadmap = Taxonomy
  - Guidance on "best practice"
  - Identify dead ends

Spatial Econometrics

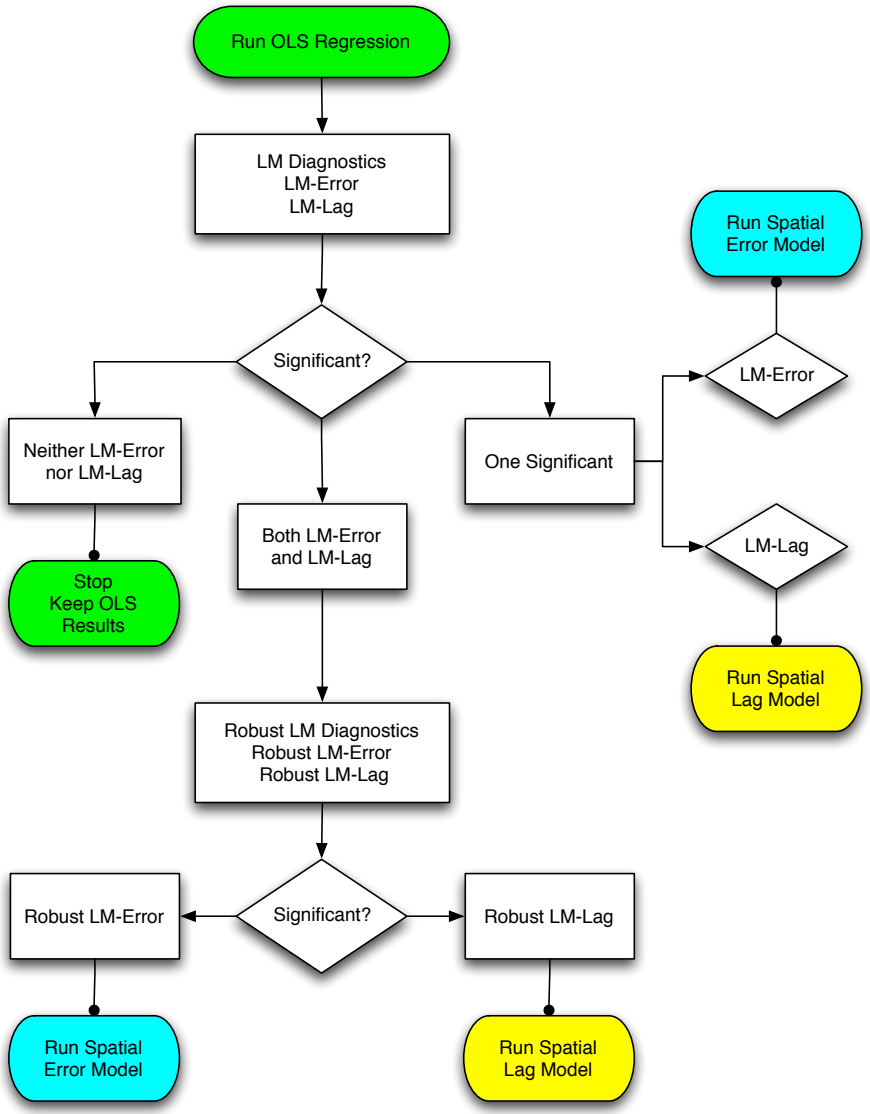
GeoDaSpace

- GUI ontop of spreg
- Subset of spreg functionality
- Cross-platform

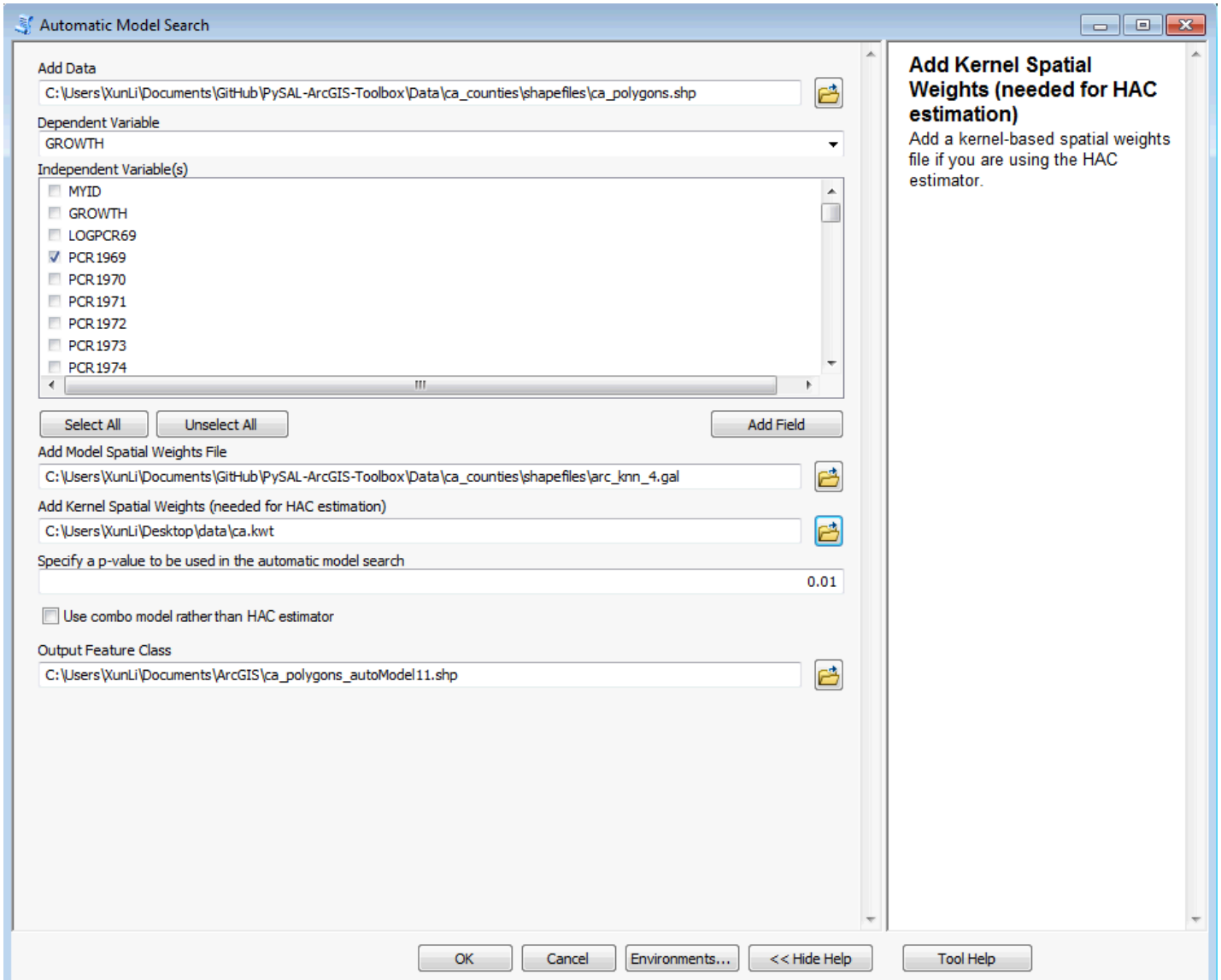
Specification Searches

- Specific to General
  - $y = X\beta + \epsilon$
  - OLS + Lagrange Multiplier Tests
- General to Specific
  - $y = \rho Wy + X\beta + (I - \lambda W)^{-1}\nu$
  - ML + Restrictions

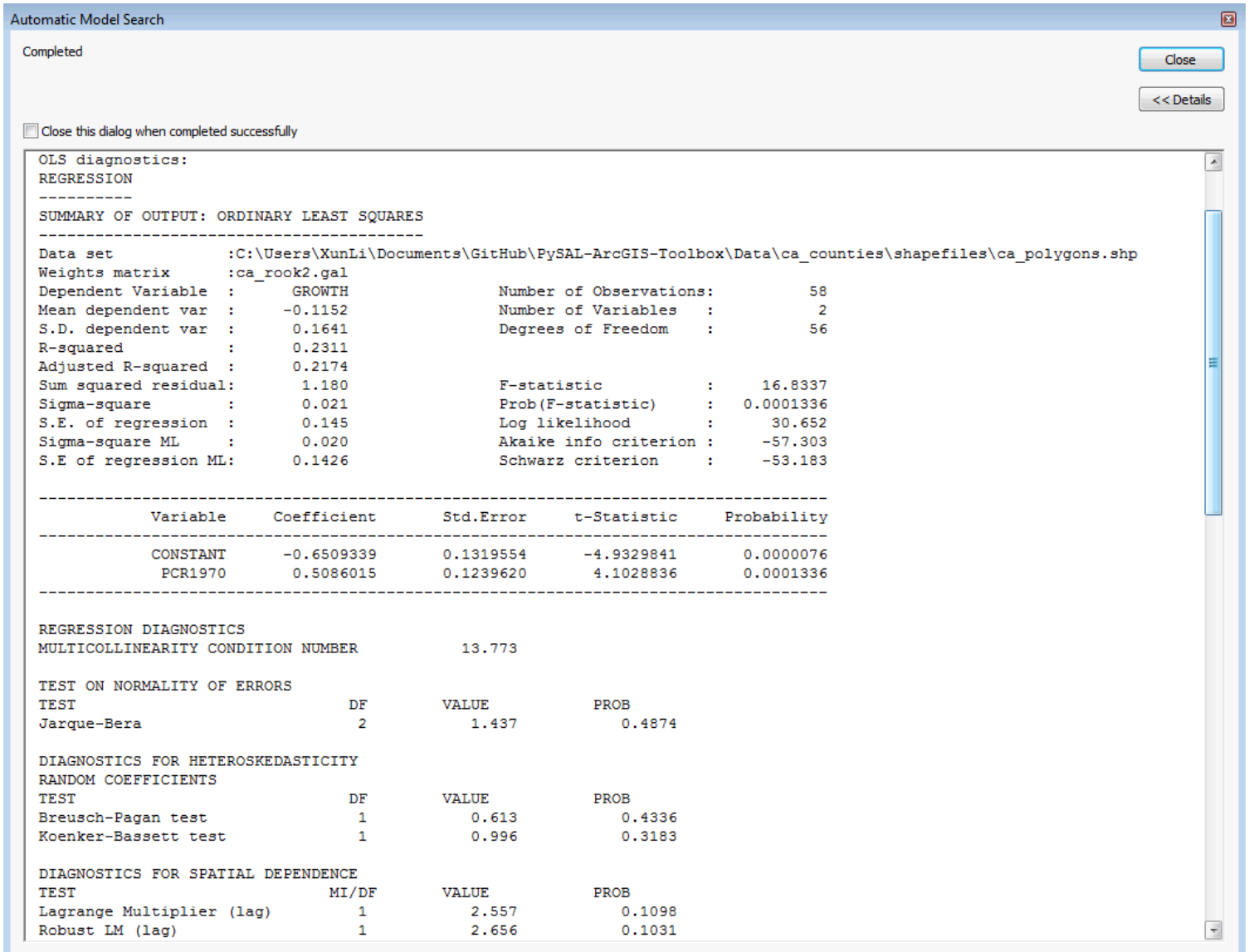
LM Based Specification



ArcGIS Toolbox



ArcGIS Toolbox

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OLS diagnostics:
REGRESSION
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SUMMARY OF OUTPUT: ORDINARY LEAST SQUARES
-----------------------------------------
Data set            :C:\Users\XunLi\Documents\GitHub\PySAL-ArcGIS-Toolbox\Data\ca_counties\shapefiles\ca_polygons.shp
Weights matrix      :ca_rook2.gal
Dependent Variable  :      GROWTH                Number of Observations:          58
Mean dependent var  :     -0.1152                Number of Variables   :           2
S.D. dependent var  :      0.1641                Degrees of Freedom    :          56
R-squared           :      0.2311
Adjusted R-squared  :      0.2174
Sum squared residual:       1.180                F-statistic           :     16.8337
Sigma-square        :       0.021                Prob(F-statistic)     :   0.0001336
S.E. of regression  :       0.145                Log likelihood        :      30.652
Sigma-square ML     :       0.020                Akaike info criterion :     -57.303
S.E of regression ML:      0.1426                Schwarz criterion     :     -53.183

------------------------------------------------------------------------------------
            Variable     Coefficient       Std.Error     t-Statistic     Probability
------------------------------------------------------------------------------------
            CONSTANT      -0.6509339       0.1319554      -4.9329841       0.0000076
             PCR1970       0.5086015       0.1239620       4.1028836       0.0001336
------------------------------------------------------------------------------------

REGRESSION DIAGNOSTICS
MULTICOLLINEARITY CONDITION NUMBER           13.773

TEST ON NORMALITY OF ERRORS
TEST                             DF        VALUE           PROB
Jarque-Bera                       2           1.437          0.4874

DIAGNOSTICS FOR HETEROSKEDASTICITY
RANDOM COEFFICIENTS
TEST                             DF        VALUE           PROB
Breusch-Pagan test                1           0.613          0.4336
Koenker-Bassett test              1           0.996          0.3183

DIAGNOSTICS FOR SPATIAL DEPENDENCE
TEST                           MI/DF       VALUE           PROB
Lagrange Multiplier (lag)         1           2.557          0.1098
Robust LM (lag)                   1           2.656          0.1031
```

Hardware

Parallel Strategy

Complex Systems Framework

Components for Autoreg