IPHONE APPS WORKSHOP FOR RUNNING BIOINFORMATICS AND GENOMICS APPLICATIONS

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Presentation Overview

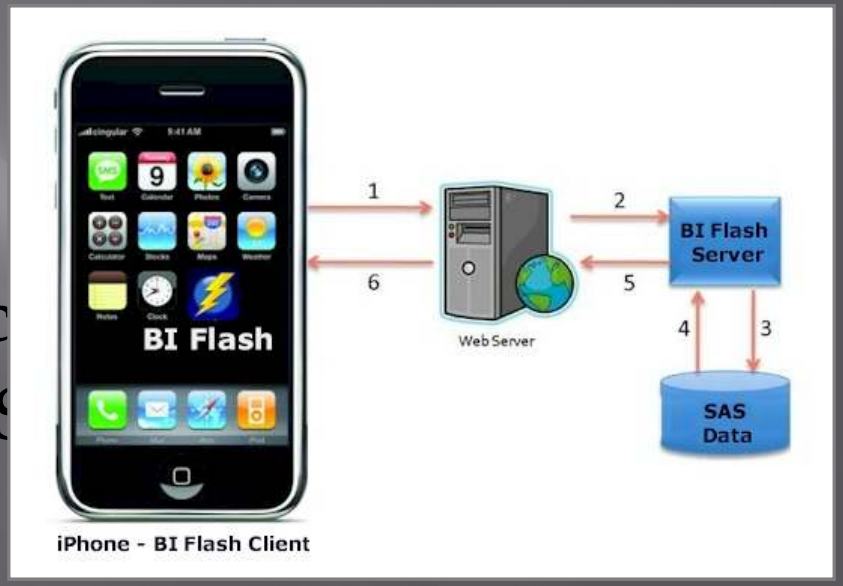
- iPhone and Mobile Computing Revolution
- System Architecture
- iPhone Software Delivery
- Server Side Computing and Communication
- User Access and Security
- Running Macros and Selecting Parameters
- Viewing SAS Data

iPhone and Mobile Computing Revolution

- Tipping Point: AppStore, 2 billion iPhone downloads with 50K apps
- Analagous to PC Revolution vs Main Frames

System Architecture

- TCP/IP Similarities Web Client
- Three Components
  - iPhone Client
  - Web Server
  - SAS Application server
- SAS Data and Macro Logic
- Data View and Parameter S



iPhone Software Delivery

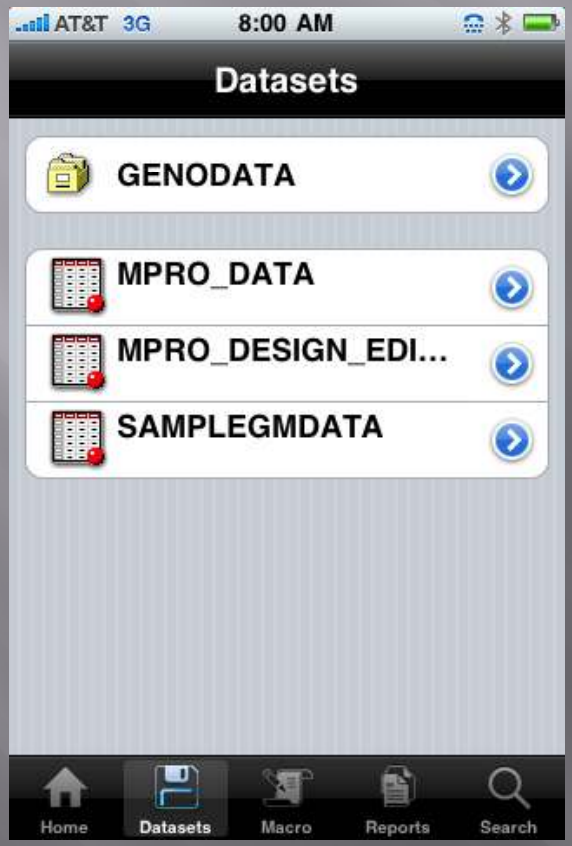
- iPhone App Store
- Search, Download, Run…
- No more Shrink Wrap Box

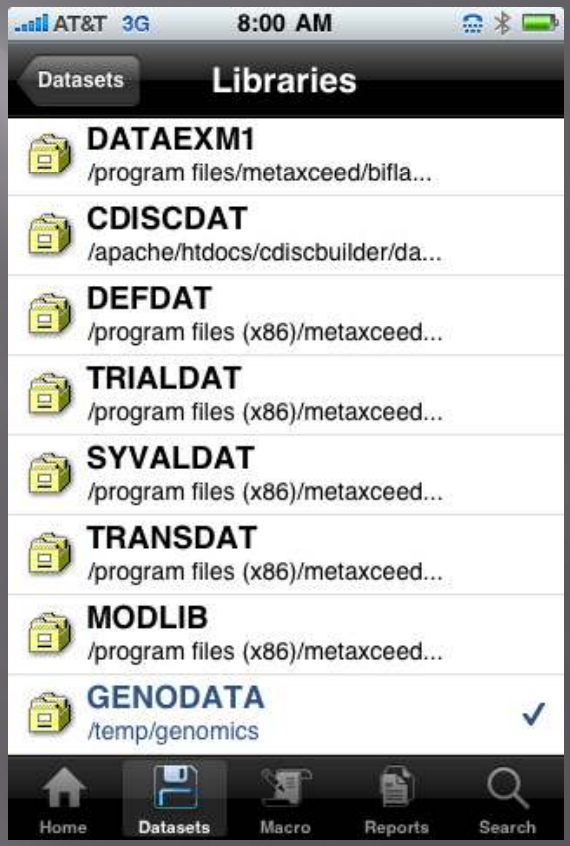
Server Side Computing and Communication

- iPhone Settings Like Control Panel
- SAS Host Server
  - Host Name
  - User Name
  - Password

Step 1 - Selecting Data

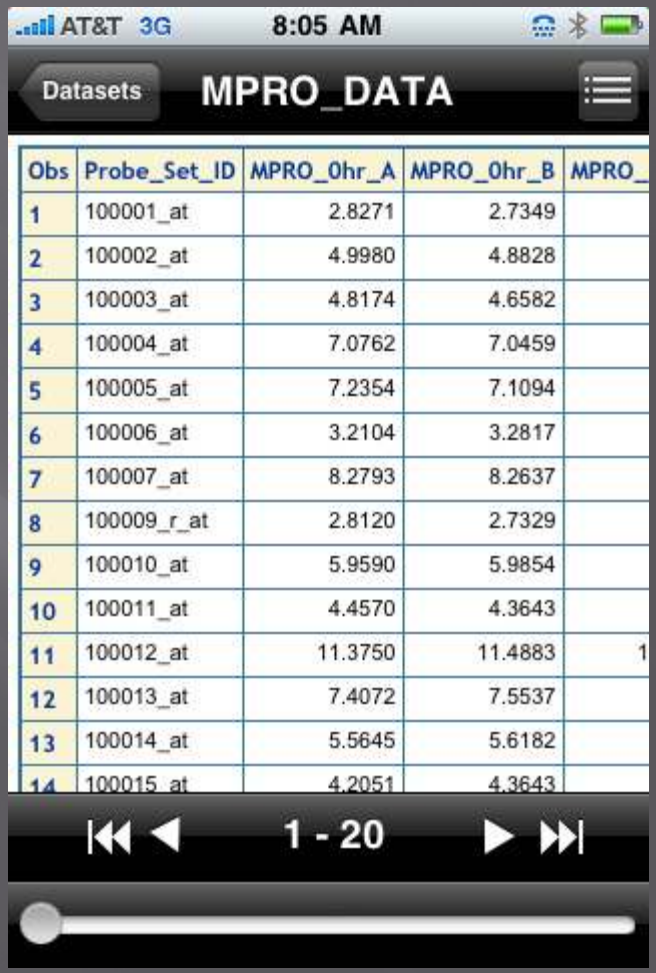
- Select SAS Dataset from SAS Libraries
- Standard iPhone Selection List





Step 2 – View Data

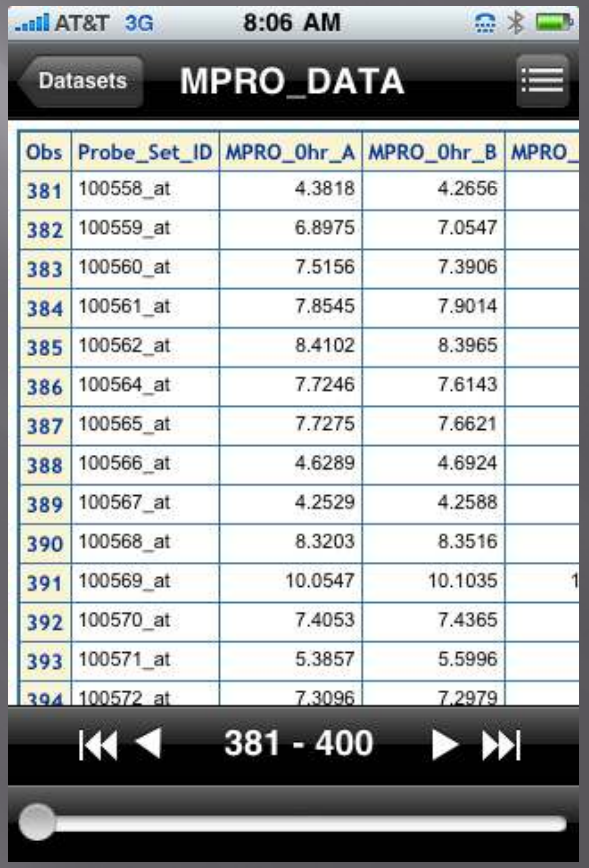
- View Micro Array Data with Gene Expression Optimized for iPhone Screen
  - ODS Optimized Fonts
  - Vertical or Landscape View
  - Dynamic Update to Date View Noted Footnote
  - Thanks to Jordan Hiller from SAS Institute for Sample Genomics Data



Obs	Probe_Set_ID	MPRO_0hr_A	MPRO_0hr_B	MPRO_
1	100001_at	2.8271	2.7349	
2	100002_at	4.9980	4.8828	
3	100003_at	4.8174	4.6582	
4	100004_at	7.0762	7.0459	
5	100005_at	7.2354	7.1094	
6	100006_at	3.2104	3.2817	
7	100007_at	8.2793	8.2637	
8	100009_r_at	2.8120	2.7329	
9	100010_at	5.9590	5.9854	
10	100011_at	4.4570	4.3643	
11	100012_at	11.3750	11.4883	1
12	100013_at	7.4072	7.5537	
13	100014_at	5.5645	5.6182	
14	100015_at	4.2051	4.3643	

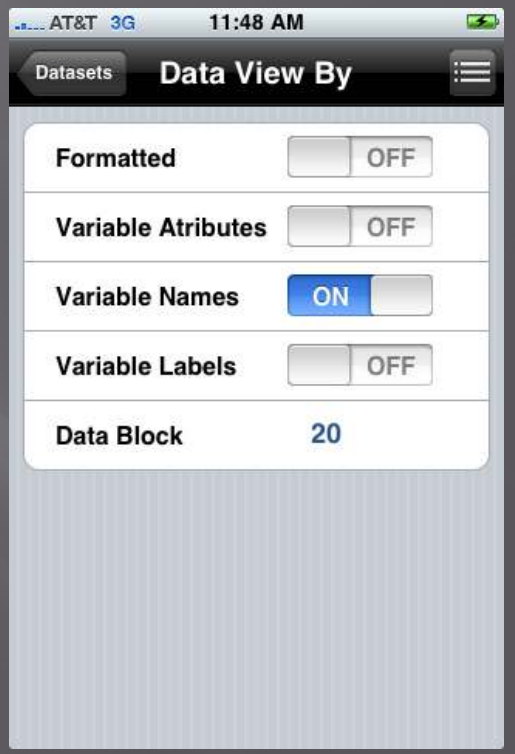
Step 3 – Navigate Data Chunks

- Chunk to Smaller Views
- Slider or List Selection for Check Selection



Step 4 – Change View Settings

- Settings Button or Application Settings
  - User Defined Formats
  - Attributes (PROC CONTENTS)
  - Variable Name Column Header
  - Variable Label Column Header
  - Data Block or Chunk Size



SAS to XML for iPhone

SAS Libraries Converted to XML

```
<Libraries>
   <Library id="1">
      <shortTitle>pgmlib</shortTitle>
      <longTitle></longTitle>
      <descriptionTitle>/myserv/lib1</descriptionTitle>
   </Library>
   <Library id="2">
      <shortTitle>datlib</shortTitle>
      <longTitle></longTitle>
      <descriptionTitle>/myserv/testlib</descriptionTitle>
   </Library>
   <Library id="3">
      <shortTitle>study</shortTitle>
      <longTitle></longTitle>
      <descriptionTitle>/myserv/testlib</descriptionTitle>
   </Library>
...
</Libraries>
```

Genomics Summary Macro

- %GENOSUM Macro Summarize Genomics Data

```
%macro genosum (indata=, invar=);
      ods listing close;
  ods html body = "genosum.html";

  title "Summary of Microarray data with Gene Expression";
  proc univariate data=&indata;
      var &invar;
  run;

  ods html close;
ods listing;

%mend;
```

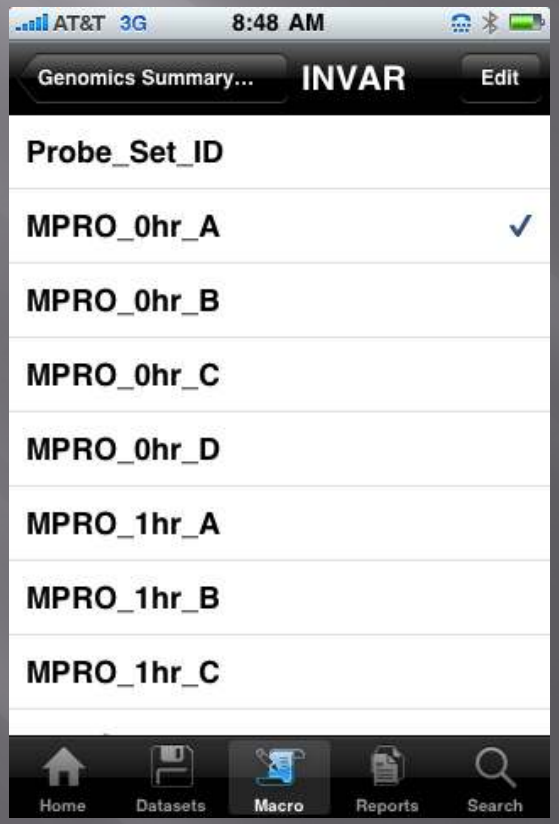
- HTML Output
  - Can be Emailed
  - Alternatively, PDF, RTF, Etc…

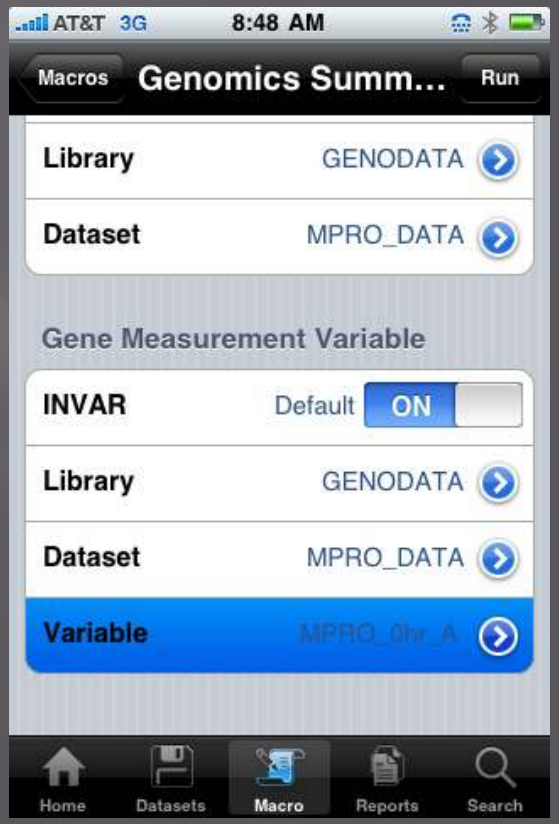
Step 1 Select Macro

- %GENOSUM Macro is Loaded to Macro Library
- Select from Standard List of Programs

Step 2 Macro Parameters

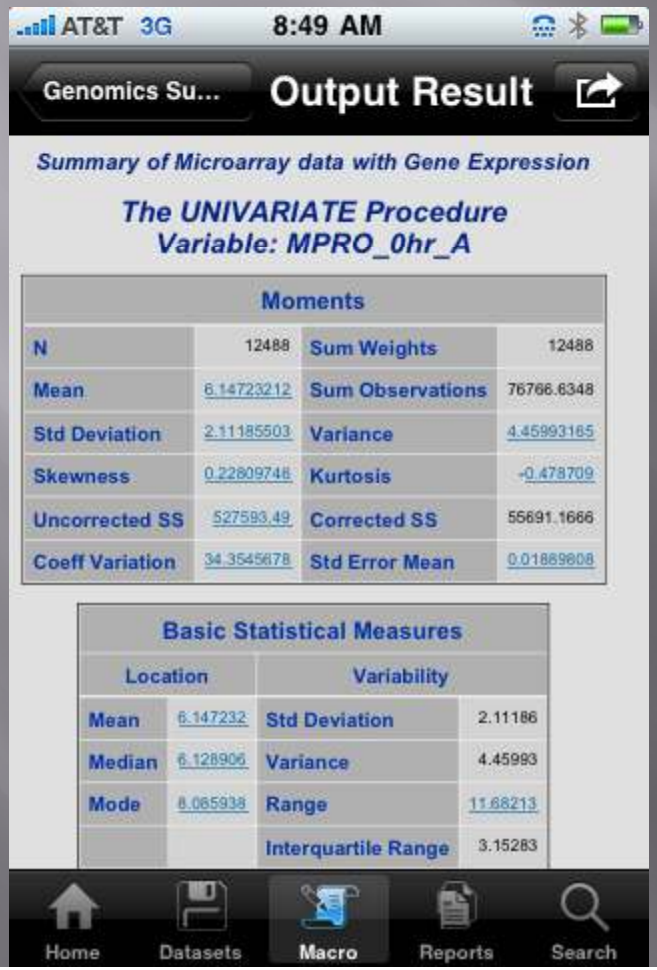
- Select Parameters based on Named Parameters
- All Selections are Pull Down Menus

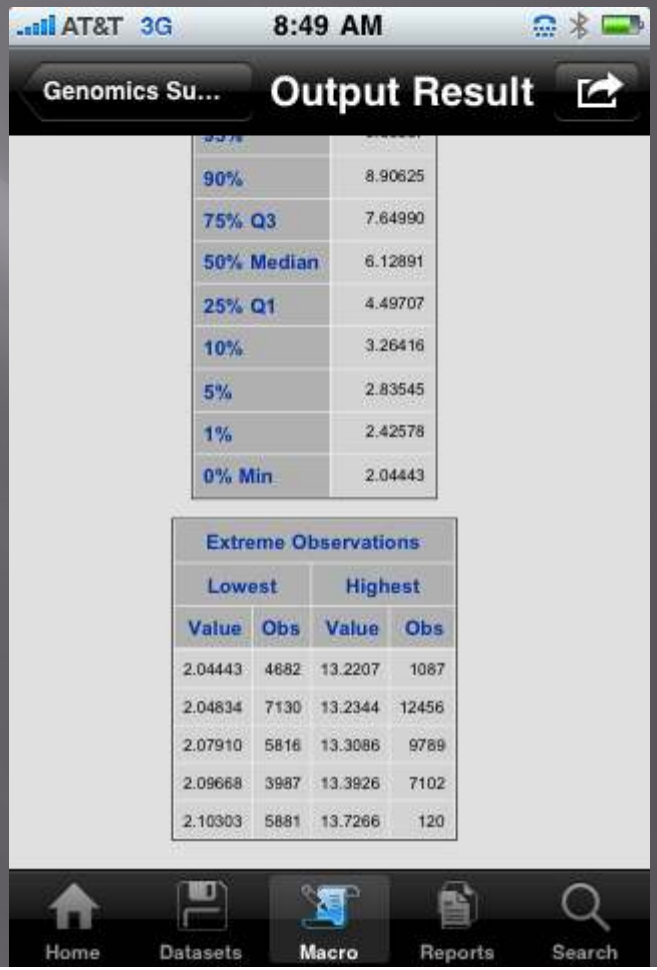




Step 3 Review Output

- Review HTML Output with Multi-Touch Pinch Zoom and Swipe





Step 4 Share Results w/Email

- Compose Email with Output as Attachments

Sample Macro With Error

- Displaying SAS Error
  1. Display ERROR
  2. Review Log

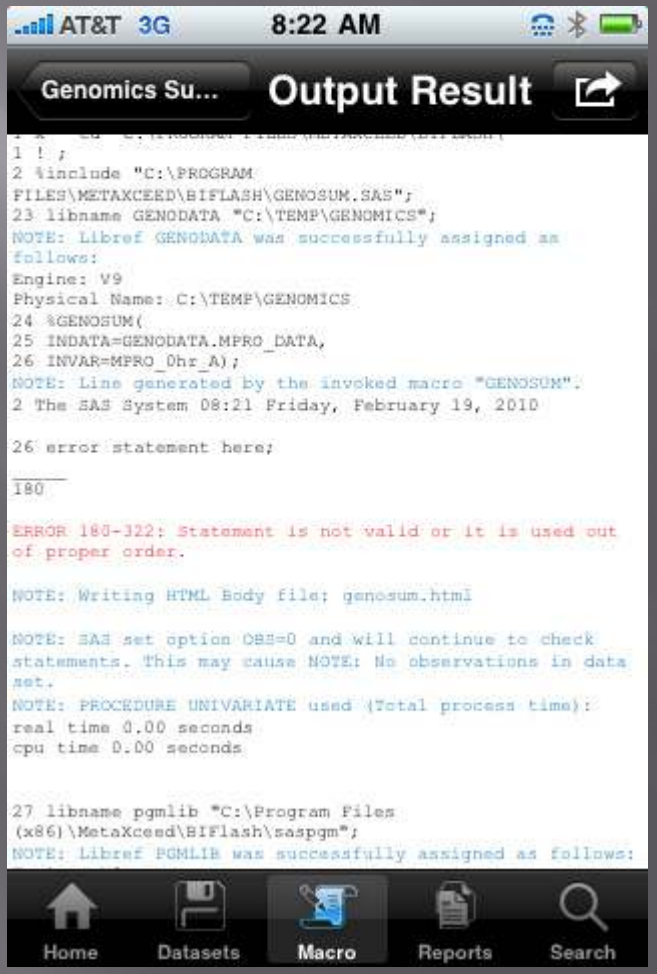
Sample ERROR in Code

genosum.sas

```
*** Program: genosum.sas ***;
*** Description: Sumarized Genomics Data ***;

%macro genosum (indata=,
                invar=
               );
  error statement here;
  ods listing close;
        ods html body = "genosum.html";

   title "Summary of Microarray data with Gene Expression";
   proc univariate data=&indata;
      var &invar;
   run;

  ods html close;
        ods listing;

%mend;
```

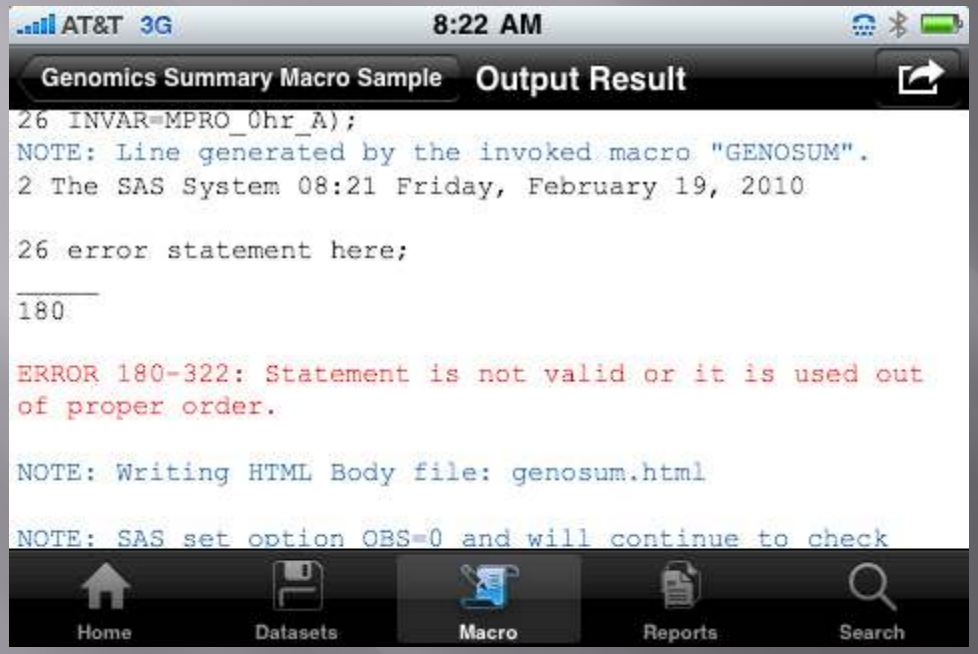
Sample Macro With Error

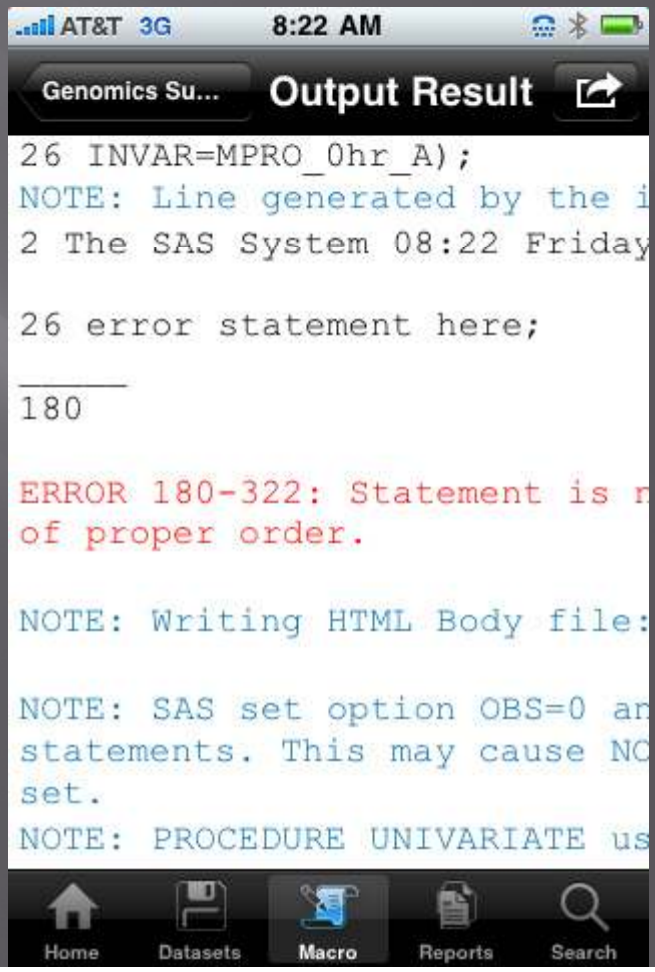
- Prompt with iPhone Pop Up



Sample Macro With Error

- Rotate, Pinch Zoom, View…





Large Genomics Data on iPhone?

Mobility and Ubiquity

User Friendly Interface

Genomics Data iPhone?... check

	Stone (40,000 B.C.)	iPhone 3G (2008)
MMS	✗	✗
Video recording	✗	✗
Videocall	✗	✗
Changeable memory cards	✗	✗
Running SAS Macros	✗	✓

Conclusion

- Software Delivery and Distribution Significantly Changed with App Store
- SAS Macro is Powerful Customizable Business Intelligence Analytical Tool
- Barriers of SAS Tools Behind IT and Servers is now Broken and Delivered to Users via iPhone
- Ubiquity of Portable Computing such as iPhone and soon iPad Delivers Information to Masses

Questions

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