



KOHLER

HEALTHCARE CONSULTING

DATA ANALYTICS: THE PAST, CURRENT TOOLS AND APPLICATIONS IN HEALTHCARE FINANCE

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Director, Kohler Healthcare Consulting



INTRODUCTION

- Texas A&M (Undergrad) and Appalachian State (MBA)
- Past president of Maryland HFMA
- Programmer since late 1970s.
- Multiple decades in healthcare finance, mostly in hospitals.
- SQL user since mid-2000s.
- Designed multiple Tableau dashboards for prior employer.
- More recent Python user.



AGENDA

History – How far we have come!

First Experiences – Healthcare Data Analytics

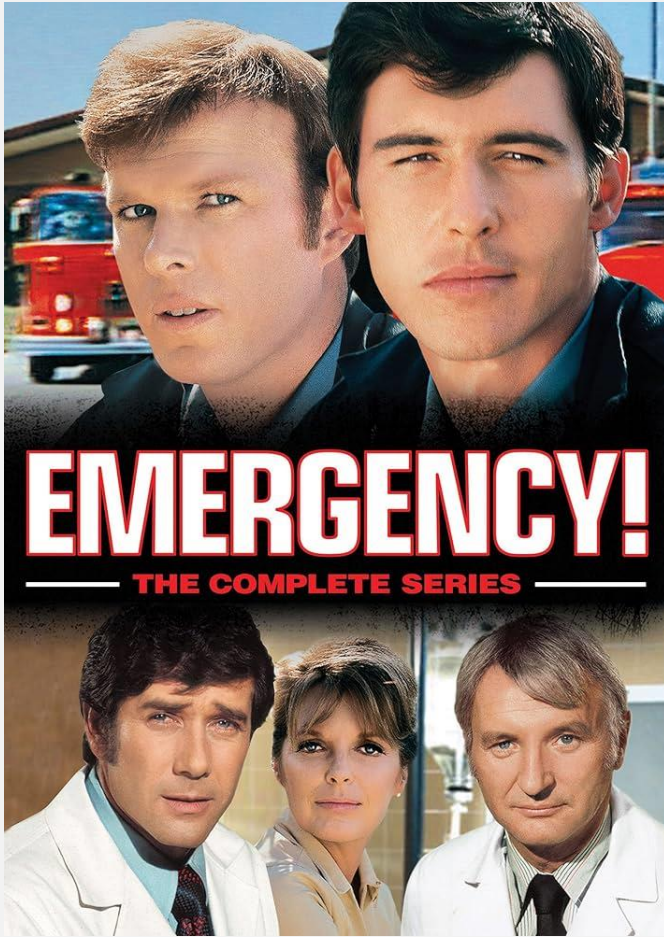
Current Tools

How to use those tools (cases)



**HISTORY: HOW
FAR WE'VE
COME**

SEARCHING MEDICAL RECORDS - 1970S



YOUR OWN PC

- Radio Shack TRS-80 Model I
- 16K (yes, 16,000) bytes of memory
- What mouse?
- Monochrome screen
- CLOAD and CSAVE
- What's a spreadsheet?





DATA ENTRY/ANALYSIS IN THE EARLY 90S

- USAir – yes, another airline that no longer exists
- Payroll data – faxed
- Airplane maintenance cards and carpal tunnel

ELECTRONIC SPREADSHEETS

Remember Lotus 1-2-3?

B1: "Principal
Worksheet Range Copy Move File Print Graph Data Quit
Global, Insert, Delete, Column-Width, Erase, Titles, Window, Status

	A	B	C	D	E
1		Principal	\$50,000		
2		Rate	13.0%		
3		Years	5		
4		Payment	1,137.65		
5					
6	Year	Begin Bal.	End Bal.	Total Paid	Interest
7	1	50,000.00	42,406.26	13,651.84	6,058.10
8	2	42,406.26	33,764.33	13,651.84	5,009.92
9	3	33,764.33	23,929.53	13,651.84	3,817.05
10	4	23,929.53	12,737.22	13,651.84	2,459.53
11	5	12,737.22	0.00	13,651.84	914.63
12					
13					
14					
15					
16					
17					
18					
19					
20					

How about early Microsoft Excel?

Microsoft Excel - ACCOUNTS.XLS
File Edit View Insert Format Tools Data Window Help

Arial A1

About Microsoft Excel
Microsoft Excel Version 5.0
Copyright © 1985-1993 Microsoft Corporation

Software Dictionary and Program: Copyright © 1984-1993
Trade Secret, Soft-Art, Inc. All rights reserved.

Available Memory: 65535 of 65535 KB Free
Math Co-processor: Present

This product is licensed to:
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Warning: This computer program is protected by copyright law and international treaties. Unauthorized reproduction or distribution of this program, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.

OK System Info...

1	September Cata			
2				
3	Product Name			
4	Dharamsala Tea			
5	Tibetan Barley Be			
6	Licorice Syrup			
7	Chef Anton's Caj			
8	Chef Anton's Gun			
9	Grandma's Boyse			
10	Uncle Bob's Orga			
11	Northwoods Cran			
12	Mishi Kobe Beef			
13	Fish Roe			
14	Cabrales Cheese			
15	Manchego La Pa			
16	Kelp Seaweed	2 kg box		\$6.00
17	Bean Curd	40 - 100 g pkgs.		\$23.25
18	Lite Sodium Soy Sauce	24 - 250 ml bottles		\$15.50
19	Butter, Medium Ch	22 - 500 g pkgs.		\$17.45

Prices Customers Accounts Employees

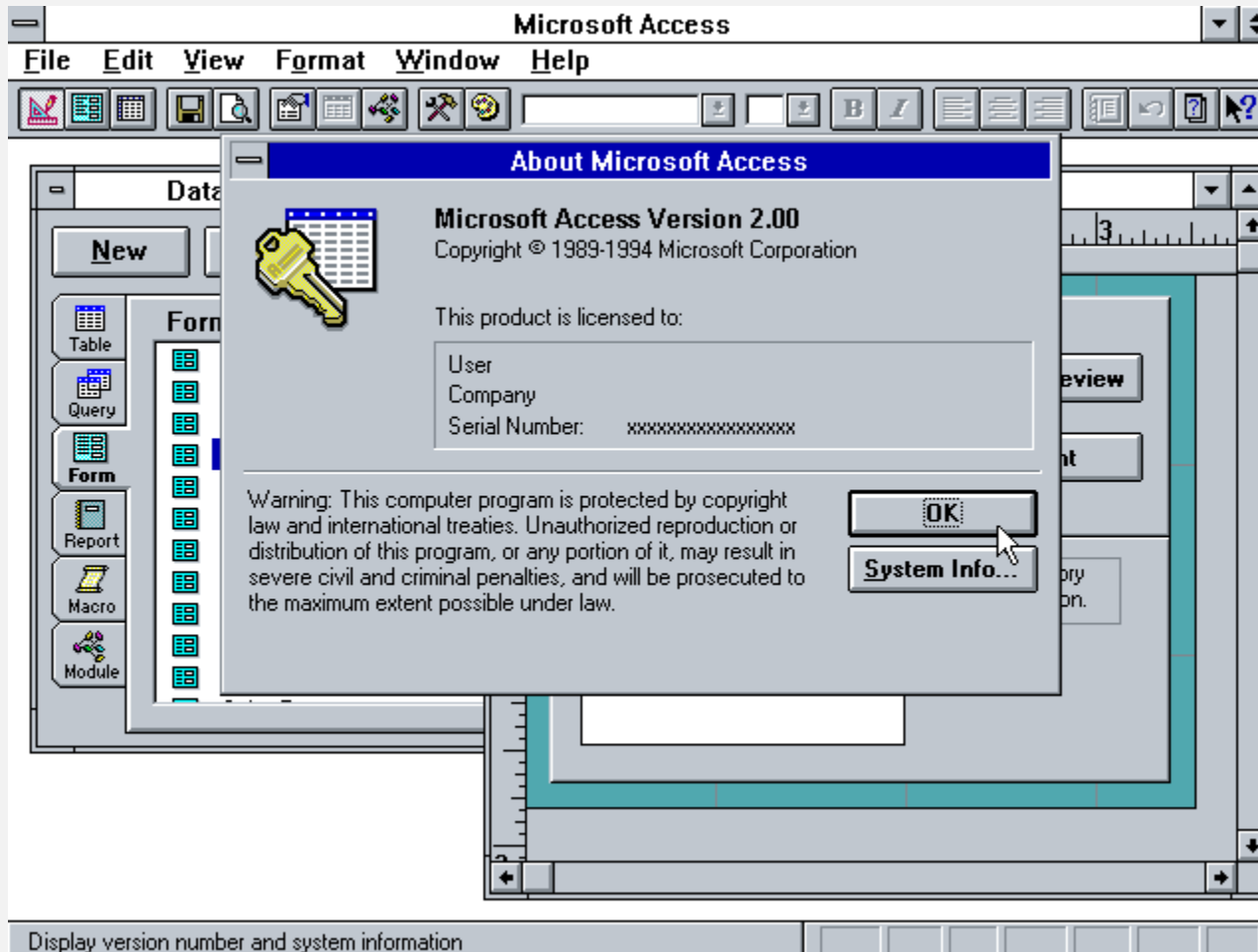
For Help on dialog settings, press F1



**HEALTHCARE
ANALYTICS –
BACK “WHEN”**

EARLY USER DATABASES

- There were a few others, but Microsoft Access is still around





HEALTHCARE ANALYTICS IN THE 90S/00S

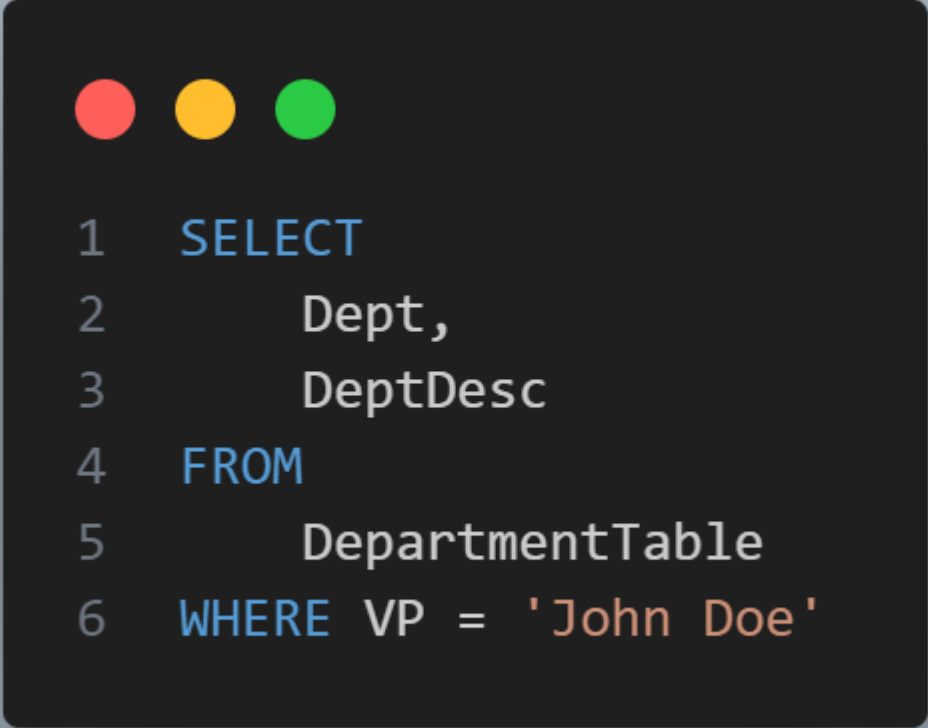
- Access databases – variance tool – monthly reports – capital budgets – anything we could think of ...
- Productivity software – faxed statistics and agency hours
- Budgets – print out on a Friday afternoon – and run ...
- Home grown operating budget tool
- Developer version of Microsoft Office



CURRENT TOOLS

SQL – THE BASICS

- Structured Query Language
- Around since 1970s
- The basics:
 - SELECT <What Fields>
 - FROM <What Source>
 - WHERE <Filter Criteria>

A terminal window with a dark background and three colored window control buttons (red, yellow, green) at the top left. The terminal displays a SQL query with line numbers 1 through 6 on the left. The query is: 1 SELECT, 2 Dept,, 3 DeptDesc, 4 FROM, 5 DepartmentTable, 6 WHERE VP = 'John Doe'.

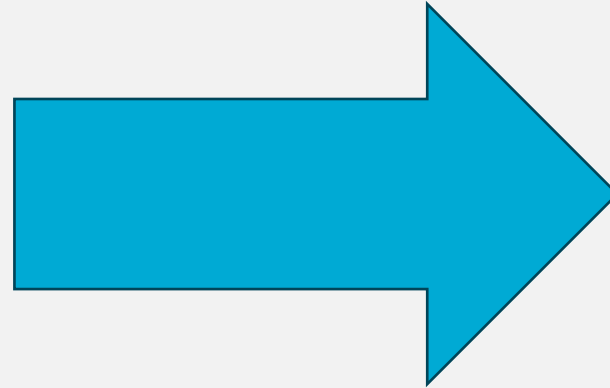
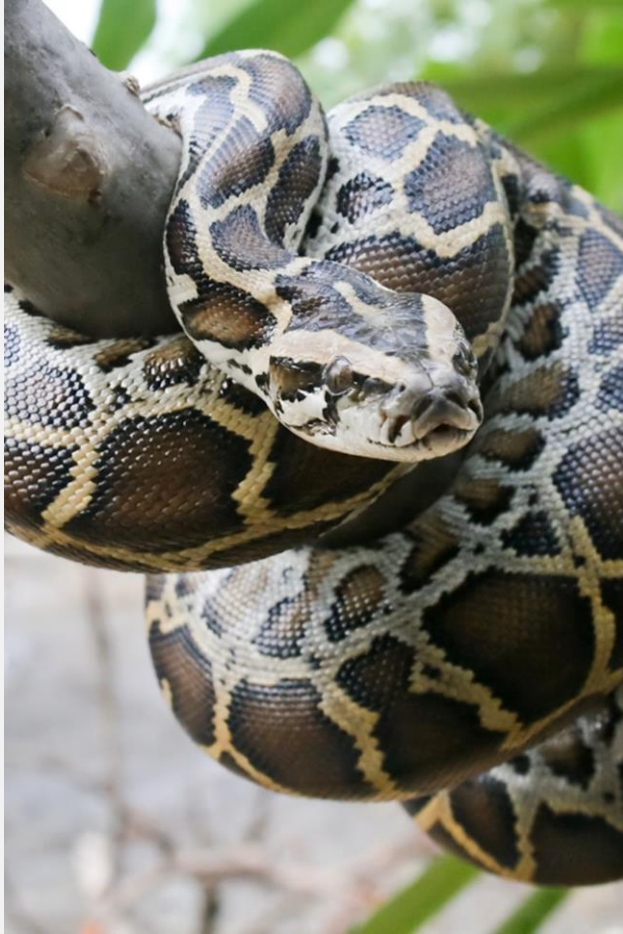
```
1  SELECT
2      Dept,
3      DeptDesc
4  FROM
5      DepartmentTable
6  WHERE VP = 'John Doe'
```

SQL – THE NOT SO BASICS



```
1 DECLARE @BACKUPDATE AS DATE = '1/20/2025'
2
3 BEGIN
4     WITH BAK_Budget_CTE
5     AS (
6         SELECT DEPT,
7             ACCT,
8             INITIATIVEID,
9             BudTtl
10        FROM [Axiom].[BUD2025History]
11        WHERE CAST(LastUpdate AS DATE) = @BACKUPDATE
12    ),
13    Compare_CTE
14    AS (
15        SELECT COALESCE(CUR.DEPT, BAK.DEPT) AS Department,
16            COALESCE(CUR.ACCT, BAK.ACCT) AS Account,
17            COALESCE(CUR.BudTtl, 0) AS CurrentTotal,
18            COALESCE(BAK.BudTtl, 0) AS BackupTotal,
19            COALESCE(CUR.BudTtl, 0) - COALESCE(BAK.BudTtl, 0) AS Variance
20        FROM [Axiom].[BUD2025] AS CUR
21        FULL OUTER JOIN [BAK_Budget_CTE] AS BAK ON CUR.ACCT = BAK.ACCT
22            AND CUR.DEPT = BAK.DEPT
23            AND CUR.INITIATIVEID = BAK.INITIATIVEID
24    )
25    SELECT S.Department,
26        COALESCE(D.Dept_Description, 'Unknown') AS DeptDesc,
27        S.Account,
28        S.CurrentTotal,
29        S.BackupTotal,
30        S.Variance
31    FROM Compare_CTE AS S
32    LEFT JOIN [Axiom].[DEPT_Full] AS D ON S.Department = D.DEPT
33    WHERE
34        S.Variance != 0
35    ORDER BY S.Department, S.Account
36 END
37
```

PYTHON IS NAMED AFTER:





PYTHON – THE BASICS

- First version released in 1991
- Think of Python as an interpreter – with lots of libraries from which to choose that give it specific features
- You need to (generally) check out libraries to do what you want
- Multi-purpose language
- Relatively easy to learn
- Pull from varied sources in the same analysis
- VERY powerful data analytics libraries that perform analytics along with graphical analysis

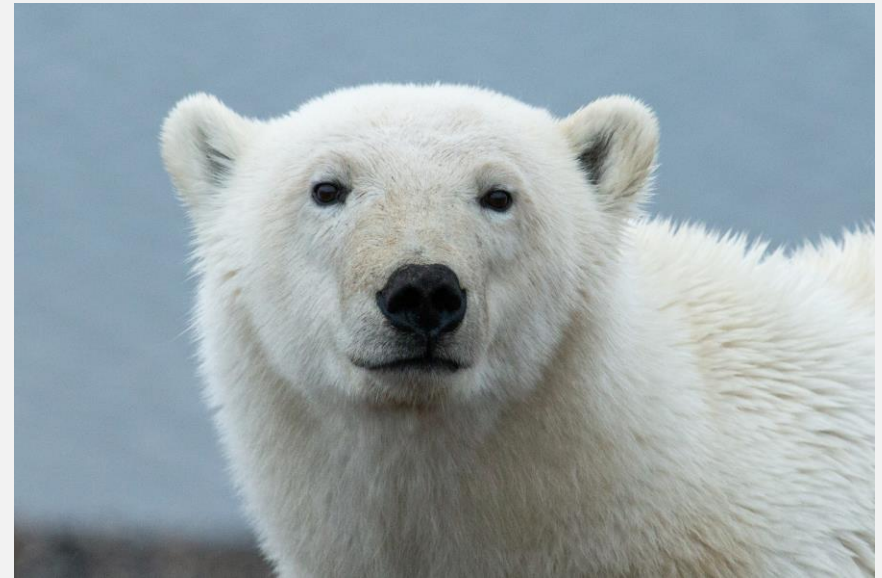
PYTHON – TWO DATA LIBRARIES




Pandas



Polars



PYTHON – QUICK EXAMPLE



```
1 # Pull in the pandas library with the alias pd
2 import pandas as pd
3
4 # Look for five characters - the first being a capital letter or a number,
5 # the next three are numbers,
6 # and the last can be a capital letter or a number
7 regex = r"([A-Z0-9][0-9]{3}[A-Z0-9])"
8
9 # Read in the data from the an Excel file and load it into a DataFrame
10 df = pd.read_excel("input_file_name.xlsx")
11
12 # Add the search results to new columns in the DataFrame
13 df["CPT_HCPCS_Breakout1"] = df["First String Name"].str.findall(regex)
14 df["CPT_HCPCS_Breakout2"] = df["Second String Name"].str.findall(regex)
15
16 # Print or export the results (in this case, both)
17 print(df)
18 df.to_excel("output_file_name.xlsx")
```



DASHBOARDS – THE BASICS

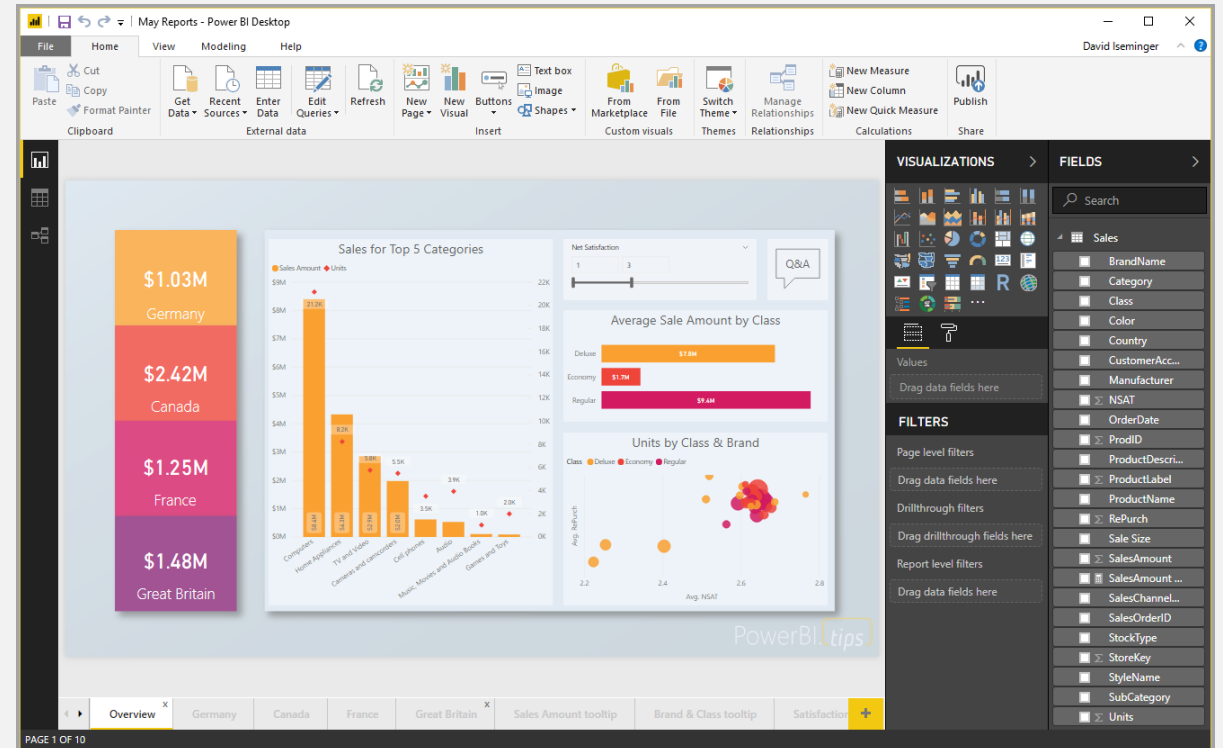
- Connect to MANY types of data sources
- Easy to get started, advanced functions available
- Visual design can make easier to spot outliers
- Interactivity – one part of dashboard reacts to changes in another
- Drilldown – keep clicking until you get to core data.

DASHBOARDS - EXAMPLES

Tableau



Microsoft Power BI



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DASHBOARDS – TABLEAU VS POWER BI

- Tableau \$\$\$; Power BI included in most enterprise packages
- Tableau first out of gate; Power BI catchup
- Very advanced functions in Tableau
- End of day, both can publish great dashboards
- Both require IS team and server space for published dashboards

YOUR SOFTWARE





USE CASES



USES FOR CURRENT TOOLS

- ER door times / admission times
- Discharge times
- Census data
- Payroll data
- Tracking changes in budget



USES FOR CURRENT TOOLS

- Monthly close process
- Chargemaster audits
- Time of service collections
- Denials
- What else – let's hear from you!



THANK YOU FOR PARTICIPATING!

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