Cross Topics nettverksmøte i Kristiansand

7. Mars

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Agenda

- 13.00 – 13.05 Velkommen Knowit
- 13.05 – 13.15 Info FANS
- 13.15 – 13.45 SAS teknologistrategi og retning
- 13.45 – 14.15 Skyreisen til Sparebanken Sør
- 14.15 – 14.25 Pause
- 14.25 – 15.05 SAS Viya og Snowflake og Singlestore
- 15.05 – 15.35 Styring og oppfølging av data kvalitet på vei mot skyen med SAS Viya
- 15.35 – 15.50 Pause
- 15.50 – 16.20 SAS Studio og Flows på SAS Viya
- 16.20 – 17.00 Migrering av DI Studio prosjekt – til SAS Studio flows med data til skyen

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FANS Network Meetings & Platform Overview the first half year of 2024

7/2	FANS | Visual Analytics - Oslo	Hybrid	13.00 – 16.00
8/2	FANS | Platform - Oslo	Hybrid	13.00 – 16.00
5/3	FANS | SAS Viya and Microsoft Azure Kubernetes	Hybrid	13.00 – 16.00
7/3	FANS | Cross Topics - Kristiansand	In-person	13.00 – 16.00
13/3	FANS | Data Science/Analytics - Oslo	Hybrid	13.00 – 16.00
14/3	FANS | Programming - Oslo	Hybrid	13.00 – 16.00
20/3	FANS | An introduction to Customer Intelligence	Virtual	10.00 – 11.00
20/3	FANS | Customer Intelligence - Oslo	Hybrid	13.00 – 16.00
10/4	FANS | SAS-nettverk for kvinner - Oslo	Hybrid	13.00 – 16.00
14/5	FANS | Cross Topics - Stavanger	In-person	13.00 – 16.00
22/5	FANS | Cross Topics - Trondheim	In-person	13.00 – 16.00
23/5	FANS | Cross Topics - Tromsø	In-person	13.00 – 16.00
28/5	FANS | SAS Platform Overview - Oslo	Hybrid	13.00 – 16.00
6/6	FANS | Sommeravslutning - Oslo	In-person	13.00 – 17.00

https://www.sas.com/sas/events/nordic/fans-nordic-sas-user-group/all-events-no.html

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SAS Innovate i Las Vegas 2024, April 16-19
ARIA Resort & Casino, Las Vegas

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- Through the FANS membership:
  5 tickets with Premium Company Membership, 7 tickets with Premium Partner Membership and 1 with Premium Personal membership.

https://innovate.sas.com/event/8ab28f0a-ebf2-40d1-a8e7-650dc34d7777/summary

- The conference program:
  - Training
  - General Sessions
  - External Keynotes
  - Breaksout Sessions
  - Round tables
  - Live Web training / Hands-on session
  - Innovation Hub:
    - Superdemos
    - SAS Booths
    - Partner Booths
- Social networking
- Nordic dinner

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- The Art of Data Visualization
- Next Gen AML & Transaction Monitoring
- SAS Starter Kit
- Unmasking Fraudsters in Banking
- Accelerate as a Data Scientist
- The Agile SAS Environment with DevOps
- Risk Lab Evolution

https://www.sas.com/sas/offers/choose-your-sas-journey.html?referid=CS1488

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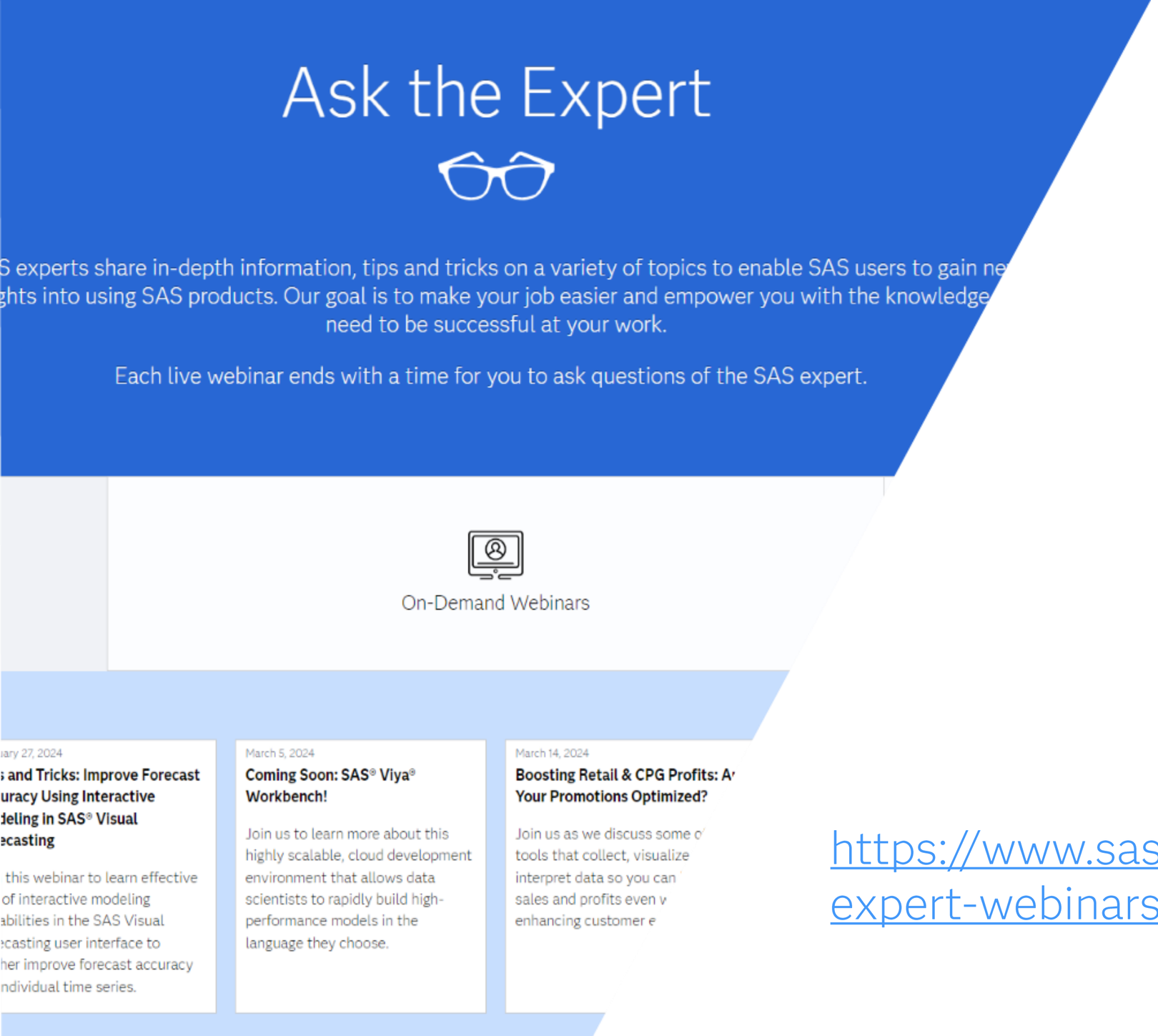

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https://www.sas.com/en_us/learn/ask-the-expert-webinars.html

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https://emea.explorers.sas.com/join/SASFCSS

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ced SAS Administration

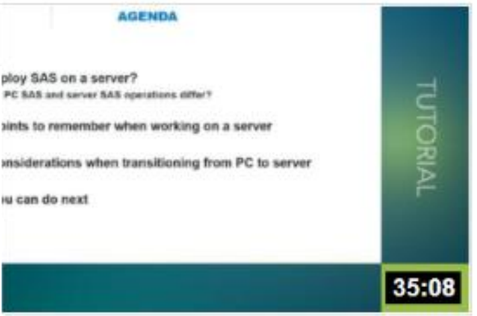
Top 10 Platform Administration Tasks

What Is SAS Grid Computing?

ying a SAS 9 Metadata Server
r

SAS Environment Manager - SAS System Availability: A 30,000 ft. View

Making the
Using the
Part 1 -

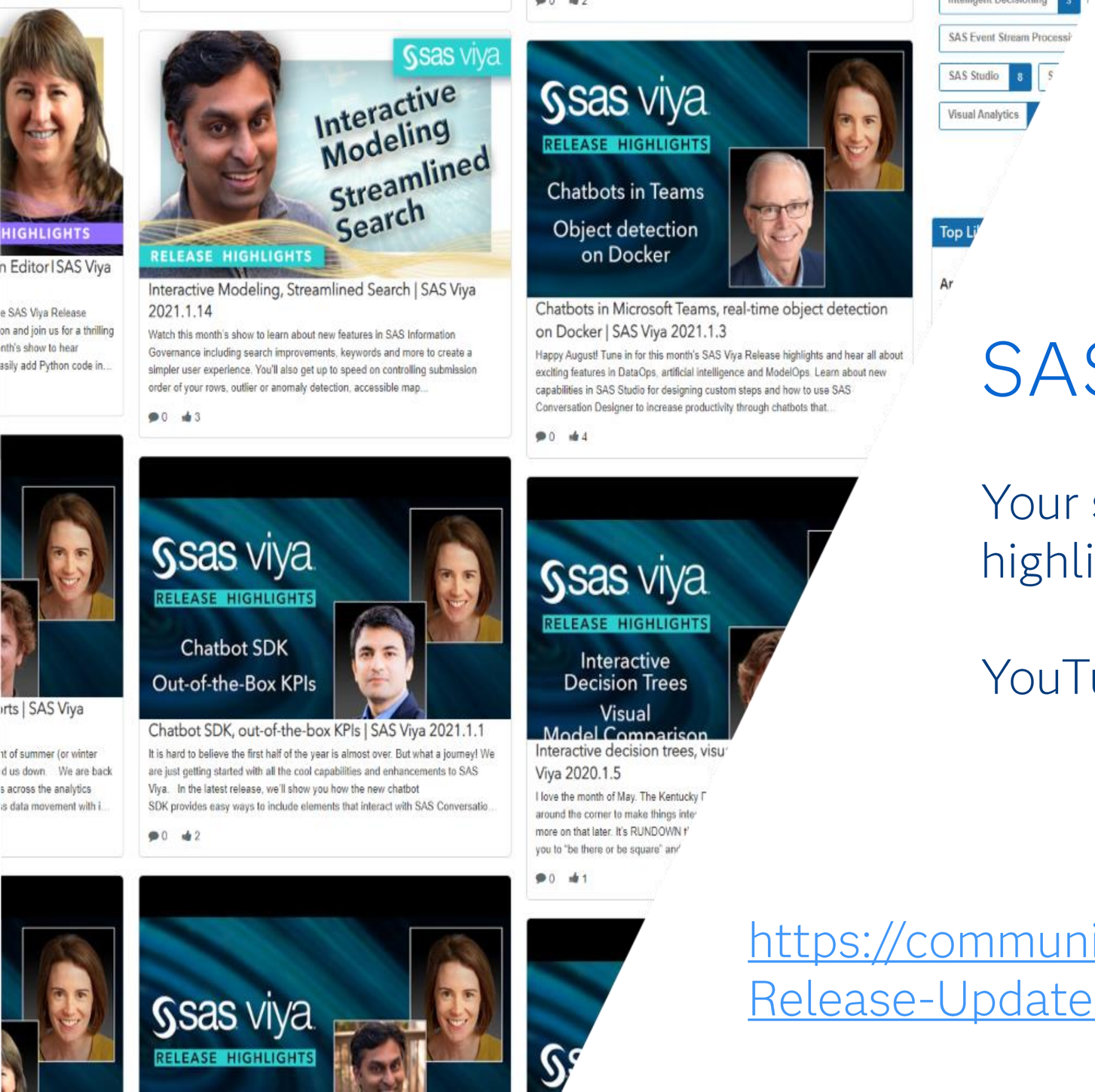


lerations for Transitioning from PC
ver

Making the most out of your Dash
Using the SAS Environment Mar
Part 2 - Example Dashboard

How To Tutorials

- How To Tutorials
- SAS Add-In for Microsoft Office
- Administration & Architecture
- Advanced Analytics
- SAS Analytics U
- Customer Intelligence
- Data Management
- SAS Enterprise Guide
- SAS Enterprise Miner
- Fraud and Security Intelligence
- SAS Life Science Analytics Framework
- SAS Office Analytics
- Programming
- Risk Management
- SAS Studio
- SAS Visual Analytics
- SAS Visual Data Mining and Machine Learning
- SAS Visual Statistics
- SAS Viya



SAS Viya Release Updates

Your source for the latest news and release highlights for SAS Viya

YouTube video's every month

https://communities.sas.com/t5/SAS-Viya-Release-Updates/tkb-p/releaseupdates

Keep yourself updated!

- The SAS documentation can be found here.
- SAS-L, the place for in-depth discussions online.
- SASENSEI, an online game where you get to test your SAS knowledge.
- Blogs, a great way to stay up to date on various fields.
- Github, where you can find SAS code that people share - recommend Roger DeAngelis.
- Articles about SAS can be found here Lexjansen.
- SAS User Groups, many regional user groups - recommend The Boston Area SAS User Groups.
- SAS Global Support Community, where you can ask questions and join discussions
- SAS Nordic Communities

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Data processing in Sas, Spss, Stata, R and Python. A comparison

Data processing in Sas, Spss, Stata, R and Python. A comparison

This document gives a brief comparison between these software packages on how to do basic data processing for statistical surveys.

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Artikkelen er en del av serien

Metoder og dokumentasjon for teknologi og innovasjon

When we are working with Statistical data we use software programs for data processing, analysis and tabulation. Which software to choose is depending on different factors like financial matters, management decisions, staff requests and so on. Five of the most commonly used software packages are the commercial Sas, Spss and Stata and the non-commercial R and Python.

This document gives a brief comparison between these software packages on how to do basic data processing for statistical surveys. It is meant to help employees who know one of the packages to learn some basics of the other ones. This is needed if the company changes from one software to another. It will also be useful for staff who co-operates with other companies who use other software than he or she usually works with. We can also use it as an introduction to one or more of the different softwares.

The versions used of the different software for this document are:

- Sas 9.4 M6
- Spss 27.0.1.0
- Stata 16.0
- R 4.0.0
- Python 3.10.5

As software always develop some of the program examples may be outdated when new versions arrive.

https://www.ssb.no/teknologi-og-innovasjon/informasjons-og-kommunikasjonsteknologi-ikt/artikler/data-processing-in-sas-spss-stata-r-and-python.a-comparison

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Analytics Proc in Enterprise guide and SAS Studio

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SAS Visual Statistics in SAS Viya

Modeling Techniques (Visual Interface)

- Linear Regression
- Logistic Regression
- Nonparametric Logistic
- GLM Regression
- GAM Regression
- Clustering
- Decision Tree

Analytical Procedures (SAS Studio Programmatic Interface)

GENSELECT (Generalized Linear Model)
KCLUS (K-means and K-modes Clustering)
NMF (Nonnegative Matrix Factorization)
SANDWICH (Sandwich Variance Estimator)
PCA (Principal Component Analysis)
LOGSELECT (Logistic Regression)
NLMOD (Nonlinear Regression)
REGSELECT (Linear Regression)
TREESPLIT (Decision Trees)
PLSMOD (Partial Least Square)
QTRSELECT (Quantile Regression)
SPC (Statistical Process Control)
LMIXED (Linear Mixed Models)
MBC (Model-Based Clustering)
SIMSYSTEM (Simulate Univariate Data)
GAMMOD (Generalized Additive Model)
GAMSELECT (Model Selection for GAM)
PHSELECT (Proportional Hazard Model)
ICA (Independent Component Analysis)
MODELMATRIX (Matrix of Covariates)

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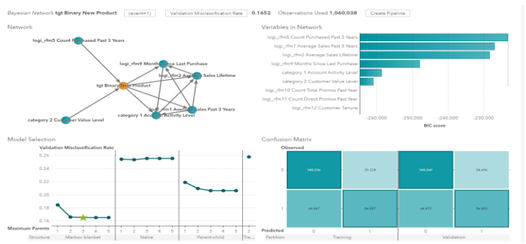
SAS Visual Data Mining and Machine Learning in Viya

Machine Learning Techniques (Visual)

- Bayesian Network
- Factorization Machine
- Forest
- Gradient Boosting
- Neural Network
- Support Vector Machine



Machine Learning Procedures (SAS Studio Programmatic Interface)

FACTMAC (Factorization Machine Model)

FOREST (Forest Model)

GRADBOOST (Gradient Boosting Model)

NNET (Neural Network)

SVMACHINE (Support Vector Machine)

SVDD (Support Vector Data Description)

BNET (Bayesian Network)

BOOLRULE (Boolean Rules)

FASTKNN (k-nearest neighbor)

GVARCLUS (Variable Clustering and Graphical Modeling)

MBANALYSIS (Association Rule Mining)

RPCA (Robust Principal Component Analysis)

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Descriptiv statistics

- SGSCATTER (Creates a paneled graph of scatter plots for multiple combinations of variables)
- MEANS (Data summarization tools to compute descriptive statistics for variables across all observations and within groups of observations)
- UNIVARIATE (Produces a variety of statistics that summarize the data distribution of each analysis variable)
- FREQ (One-way to *n*-way frequency and contingency (crosstabulation) tables)
- CORR (Computes Pearson correlation coefficients, three nonparametric measures of association, polyserial correlation coefficients, and the probabilities associated with these statistics)
- TTEST (Performs *t* tests and computes confidence limits for one sample, paired observations, two independent

Visual Data – graph

- SGPLOT (Bar Chart, *vbar*)
- SGPLOT (Bar-Line Chart, *vbar/vline*)
- SGPLOT (Boxplot, *vbox*)
- SGPLOT (Bubble Plot, *bubble*)
- SGPLOT (Heat Map, *heatmap*)
- SGPLOT (Histogram, *histogram*)
- SGPLOT (Line Chart, *vline*)
- FREQ (Mosaic Plot, *MosaicPlot*)
- TEMPLATE (Pie Chart, *piechart*)
- SGPLOT (Scatter Plot, *scatter*)
- SGPLOT (Series Plot, *series*)

https://go.documentation.sas.com/doc/en/pgmsascdc/9.43.5/grstatproc/n0yjdd910dh59zn1toodgupaj4v9.htm

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Visual Data – Map

- SGMAP (Choropleth Map, *choromap*)
- SGMAP (Text Map, *text*)
- SGMAP (Bubble Map, *bubble*)
- SGMAP (Scatter Map, *scatter*)
- SGMAP (Series Map, *series*)

Visual Data – control charts

- SHEWHART (Box Chart)
- SHEWHART (C Chart)
- SHEWHART (Individual Measurements Chart)
- SHEWHART (Mean and Range Chart)
- SHEWHART (Mean and Standard Deviation Chart)
- SHEWHART (np Chart)
- SHEWHART (p Chart)
- SHEWHART (u Chart)

https://support.sas.com/documentation/onlinedoc/qc/141/shewhart.pdf

http://www.math.wpi.edu/saspdf/qc/chap31.pdf

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Regression Models

- GLMSELECT/REG (Linear Regression with classification/continous variables)
- COUNTREG (Count Regression in which the dependent variable takes nonnegative integer or count values)
- GLM (One- Way Anova with categorical variables)
- GLM (N-Way Anova with factors)
- GLM (Analysis of Covariance with categorical variables/continuous covariate)
- NPAR1WAY (Nonparameteric One-Way ANOVA with classification variable)
- LOGISTIC (Binary Logistic Regression with classification/continuous variables, Link function: Logit, Probit and LogLog)
- GLMSELECT (Predictive Regression Models with classification/continuous variables)
- GENMOD (Generalized Linear Models with classification/ continuous variables, distributions: Normal, Binomial, Gamma, Inverse Gaussian, Multinomial, Negative binomial, Poisson, Tweedie, Zero-inflated negative binomial/Poisson)
- MIXED (Mixed Models with classification and continuous variables (random and fixed effects))
- PLS (Partial Least Squares Regression with classification/continuous variables)
- ROBUSTREG (Robust Regression with different methods: M Estimation, LTS Estimation, S Estimation, MM Estimation and M Estimation (tuned))
- ENTROPY (Entropy used to estimation of simultaneous systems of linear regression models)
- MDC (Multinomial Discrete Choice Modeling is used when the dependent variable takes multiple discrete values)

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Survival Analysis

- LIFETEST (Nonparametric Survival Analysis)
- PHREG (Cox Proportional Hazards Regression)

Forecasting

- TIMEDATA (Time Series Data Preparation)
- TIMESERIES (Time Series Exploration)
- ARIMA (Modeling and Forecasting Random walk/Moving average/Arima/Arimax)
- ESM (Exponential Smoothing Models)
- UCM (Unobserved Components Models forecasts equally spaced univariate time series, decomposes the response series into components such as trend, seasonals, cycles, and the regression effects due to predictor serie)

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Econometrics

- MODEL (Causal Models with exogenous/endogenous/excluded instrumental variables)
- AUTOREG (Cross-sectional Data Linear Models, Regression with autocorrelated and hetroscedastic errors)
- GLIM (Cross-sectional Data Logit/Probit/Censored/Truncated Models)
- PANEL (Panel Data Linear Models with cross-sectional/time ID)
- GLIM (Panel Data Logit/Probit/Censored/Truncated Models)
- COUNTREG (Panel Data Poisson/Negative Binomial Models)
- COUNTREG (Cross-sectional Data Poisson/Poisson Zero-inflated/ Negative Binomial/Negative Binomial Zero-inflated)
- SEVERITY (Severity Models continuous and categorical variables)
- SPATIALREG (Spatial Regression Models with continuous and categorical variables, analyzes spatial econometric models for cross-sectional data whose observations are spatially referenced or georeferenced)
- ARIMA (Univariate Time Series Analysis ARIMA/ARIMAX)
- VARMAX (Multivariate Time Series Analysis, variables arn't only contemporaneously correlated with each other, but also with each other's past values)
- PDLREG (Estimates regression models for time series data in which the effects of some of the regressor variables are distributed across time)
- TSCREG (Time Series Cross Section Regression , panel data sets that consist of time series observations on each of several cross-sectional units)

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Multivariate Analysis

- PRINCOMP (Principal Component Analysis)
- FACTOR (Factor Analysis)
- CANCORR (Canonical Correlation)
- DISCRIM (Discriminant Analysis)
- CORRESP (Correspondence Analysis)
- PRINQUAL (Multidimensional Preference Analysis)
- COPULA (COPULA enables you to fit multivariate distributions or copulas from a given sample data set)
- EXPAND (Expand is useful when you need to combine series with different sampling intervals into a single data set)
- SIMILARITY (Computes similarity measures associated with time-stamped data, time series, and other sequentially ordered numeric data)
- SPECTRA (Spectral and cross-spectral analysis of time series, used to look for periodicities or cyclical patterns in data))

Cluster Analysis

- DISTANCE (Compute Similarities and Distances)
- VARCLUS (Cluster Variables)
- STDIZE/FASTCLUS (K-Means Clustering)
- DISTANCE/CLUSTER (Cluster Observations)
- ACECLUS (Estimate Within-Cluster Covariances)

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High-Performance Models

- HPCOUNTREG (High-performance Count Regression in which the dependent variable takes on nonnegative integer or count values)
- HPPANEL (High-performance Panel analyze a class of linear econometric models that commonly arise when time series and cross-sectional data are combined)
- HPCDM (High-performance Compound distribution Model are modeling the severity of loss and the frequency of loss separately)
- HPQLIM (High-performance Qualitative and Limited dependent variable model analyzes univariate limited dependent variable models)
- HPSEVERITY (High-performance Severity provides a default set of probability distribution models; Burr, exponential, gamma, generalized Pareto, inverse Gaussian, lognormal, Pareto, Tweedie, and Weibull distributions)

Other Models

- QLIM **(Qualitative and Limited dependent variable Model, univariate and multivariate limited dependent variable models, include logit, probit, tobit, selection, and multivariate models)**
- SSM **(State Space Models used for analyzing continuous response variables that are recorded sequentially according to a numeric indexing variable)**

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Simulation

- HPCOPULA (High-Performance Copula is a high-performance version of the SAS/ETS COPULA procedure, which simulates data from a specified Copula)
- SIMLIN (Perform simulation or forecasting of the endogenous variables)

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Examples

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Regression Models

Linear Regression with classification and continous variables

```
proc glmselect data=SASHELP.CARS outdesign(addinputvars)=Work.reg_design;
        class Origin / param=glm;
        model MPG_Highway=EngineSize Cylinders Horsepower Origin/
showpvalues
                selection=none;
run;

proc reg data=Work.reg_design alpha=0.05 plots(only)=(diagnostics residuals
                observedbypredicted);
        where Origin is not missing;
        ods select DiagnosticsPanel ResidualPlot ObservedByPredicted;
        model MPG_Highway=&_GLSMOD /;
        run;
quit;
```

One-Way Anova with categorical variable

```
proc glm data=SASHELP.CARS;
        class Origin;
        model MPG_Highway=Origin;
        means Origin / hovtest=levene welch plots=none;
        lsmeans Origin / adjust=tukey pdiff alpha=.05;
        run;
quit;
```

Nonparameteric One-Way ANOVA with classification variable

```
proc npar1way data=SASHELP.CARS wilcoxon plots(only)=(wilcoxonboxplot);
        class Origin;
        var MPG_Highway;
run;
```

N-Way Anova with factors

```
proc glm data=SASHELP.CARS;
        class Make Model Origin Type;
        model MPG_Highway=Make Model Origin Type Model*Origin
                        Model*Type Origin*Type  Model*Origin*Type
                        / ss1 ss3;
        lsmeans Make Model Origin Type / adjust=tukey pdiff=all alpha=0.05 cl;
quit;
```

Analysis of Covariance with Categorical variables and continuous covariate

```
proc stdize data=SASHELP.CARS method=mean out=work._ancova_stdize;
        var Cylinders;
run;

proc glm data=work._ancova_stdize;
        class Origin;
        model MPG_Highway=Origin Cylinders Cylinders * Origin;
        lsmeans Origin / adjust=tukey pdiff alpha=.05;
quit;
```

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Regression Models

Binary Logistic Regression with classification **variables**

```
proc logistic data=CREDIT_DISCOVERY_FOR_DS_DATA;
        class CREDIT_LIM CREDIT_SCORE / param=glm;
        model writeoff(event='YES')=CREDIT_LIM CREDIT_SCORE / link=logit
technique=fisher;
run;
```

Predictive Regression Models with classification **variables**

```
proc glmselect data=SASHELP.CARS plots=(criterionpanel);
        class Origin Make / param=glm;
        model MPG_Highway=Origin Make EngineSize Cylinders Horsepower /
                selection=stepwise
(select=sbc) hierarchy=single;
run;
```

Generalized Linear Models with classification variables

```
proc genmod data=SASHELP.CARS plots=(predicted resraw(index) stdreschi(index) );
        class Make Origin / param=glm;
        model MPG_Highway=Make Origin EngineSize Cylinders Horsepower /
dist=normal;
run;
```

Mixed Models with classification and continuous variables (random and fixed effects)

```
proc mixed data=SASHELP.CARS method=reml plots=(residualPanel)
alpha=0.05;
        class Make Origin;
        model MPG_Highway= /;
        random Intercept / type=VC subject=Make;
run;
```

Partial Least Squares Regression **with classification variables**

```
proc pls data=SASHELP.CARS method=pls plots;
        class Make Origin;
        model MPG_Highway=Make Origin EngineSize Cylinders
        Horsepower EngineSize*Cylinders EngineSize*Horsepower
        Cylinders*Horsepower;
run;
```

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Forecasting

```
proc sort data=PUBLIC.DATA_FORECAST out=Work.preProcessedData;
        by price discount cost Txn_Month;  run;
```

ARIMAX

```
proc arima data=Work.preProcessedData plots
(only)=(series(corr crosscorr) residual(corr normal) forecast(forecastonly));
        identify var=sale crosscorr=(line product);
        estimate p=(1) (12) q=(1) input=(line product) method=ML;
        forecast lead=12 back=0 alpha=0.05 id=Txn_Month interval=Month;
        outlier;
        by price discount cost;
        run;
quit;
```

ESM

```
proc esm data=Work.preProcessedData back=0 lead=12 plot=(corr errors
                modelforecasts);
        by price discount cost;
        id Txn_Month interval=Month;
        forecast sale / alpha=0.05 model=simple transform=none;
run;
```

UCM

```
proc ucm data=Work.preProcessedData;
        id Txn_Month interval=Month;
        model sale;
        irregular;
        level;
        forecast lead=12 back=0 alpha=0.05;
        outlier;
        by price discount cost;
run;
```

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Multivariate Analysis

Principal Component Analysis

```
proc princomp data=SASHELP.CARS plots(only)=(scree);
        var EngineSize Cylinders Horsepower Invoice Weight Length;
run;
```

Factor Analysis

```
proc factor data=SASHELP.CARS method=principal nfactors=7 plots=(scree);
        var MSRP Invoice EngineSize Cylinders Horsepower Weight Length;
run;
```

Canonical Correlation

```
proc cancorr data=SASHELP.CARS;
        /*** The VAR statement defines Variable set 1 ***/
        var EngineSize;

        /*** The WITH statement defines Variable set 2 ***/
        with Cylinders;
run;
```

Discriminant Analysis

```
ods noproctitle;

proc discrim data=SASHELP.CARS pool=yes;
        class Model;
        var Invoice EngineSize Cylinders Horsepower;
        priors prop;
run;
```

Correspondence Analysis

```
proc corresp data=SASHELP.CARS dimens=2 plots;
        tables Make Origin, Invoice EngineSize Cylinders Horsepower;
run;
```

Multidimensional Preference Analysis

```
proc prinqual data=SASHELP.CARS mdpref n=2 plots
out=Work.Prinqual_Scores
                replace;
        transform monotone(EngineSize Cylinders Horsepower);
run;
```

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Cluster Analysis

Compute Similarities and Distances

```
proc distance data=SASHELP.CARS method=dgower out=work.Distance_dist;
        var interval(MPG_Highway / std=range) ordinal(EngineSize Cylinders
Horsepower / std=range) nominal(Origin Model);
run;
```

Cluster Variables

```
proc varclus data=SASHELP.CARS hierarchy plots;
        var EngineSize Cylinders Horsepower Weight Length;
run;
```

K-Means Clustering

```
proc stdize data=SASHELP.CARS out=Work._std_ method=range;
        var EngineSize Cylinders Horsepower Weight Length;
run;

proc fastclus data=Work._std_ maxclusters=100;
        var EngineSize Cylinders Horsepower Weight Length;
run;
```

Cluster Observations

```
proc distance data=SASHELP.CARS method=dgower
out=Work._tmp_distances;
        var interval(EngineSize Cylinders Horsepower / std=std)
ordinal(Invoice Weight
                Length / std=std) nominal(Make Model Type Origin);
run;

proc cluster data=Work._tmp_distances method=ward plots;
        var Dist:;
run;
```

Estimate Within-Cluster Covariances

```
proc aceclus data=SASHELP.CARS proportion=0.1;
        var EngineSize Cylinders Horsepower;
run;
```

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