Describing Through-Time Data: The Run Chart

Data Science for Quality Management: Describing Data Graphically

with **Wendy Martin**

Learning objective:

Construct a run chart using RStudio

Statistical Analysis

Statistical analysis has two parts:

- Graphics: pictures that provide a visual representation of what the numbers describe or identify

Statistical Analysis

- Numerics: numbers and statistical calculations which summarize and describe our data

Statistical Analysis

We always use both pictures and numbers (‘never present a picture without stats; never present stats without a picture’!)

Arranging and Presenting Data

The first step in the analysis and interpretation of data from a random sample is the arrangement and presentation of the data.

This should be done by first graphically describing the data.

Common Methods of Graphically Describing Sample Data

- Run Charts
- Frequency Distributions
  - ✓ Ungrouped
  - ✓ Grouped
  - ✓ Relative

Common Methods of Graphically Describing Sample Data

- Histograms
- Frequency Polygons
- Box and Whisker Plots

Presenting Data As Observed Through Time: Run Charts

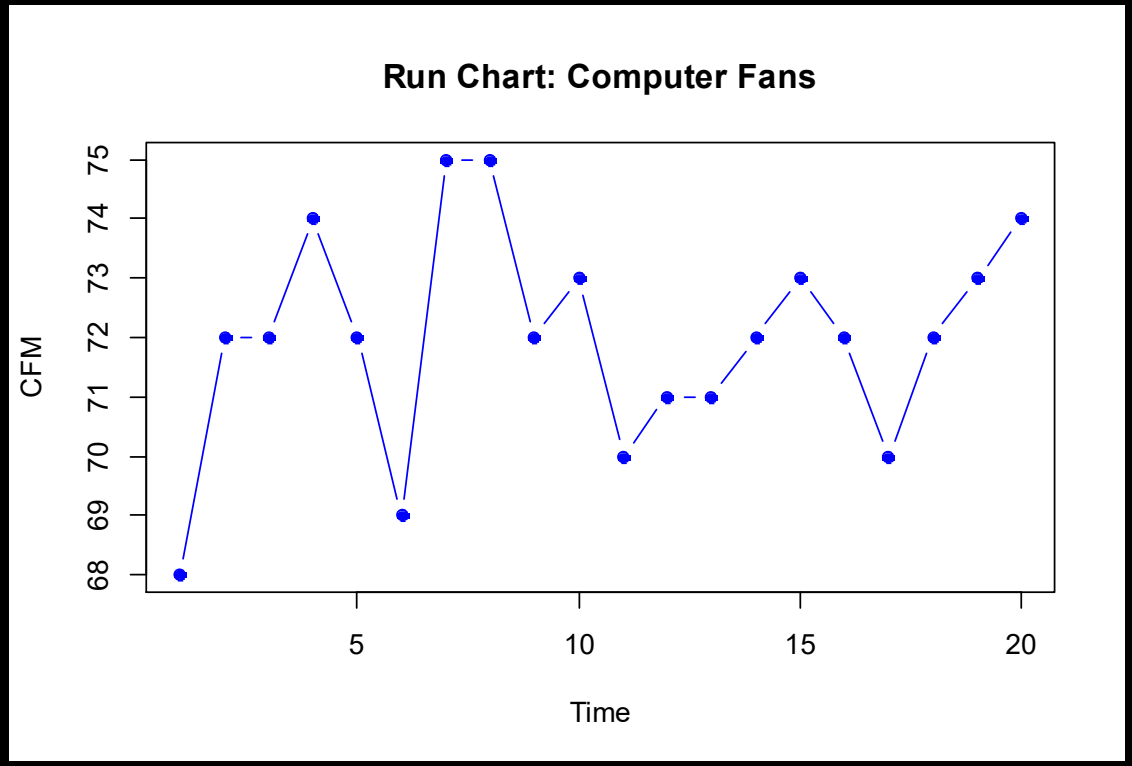
An engineer gathered 20 consecutive computer fans from a production line, keeping track of the order in which the fans were produced.

Presenting Data As Observed Through Time: Run Charts

Then these fans were tested for air flow in CFM. This testing produced the following data for the 20 fans, presented in time order.

Fans 1-10:	68	72	72	74	72	69	75	75	72	73
Fans 10-20:	70	71	71	72	73	72	70	72	73	74

Run Chart Example



Step 1: Create the Data File

Create a Vector

```
cfm <- c(68,72,72,74,72,69,75,75,72,73,70,71,71,72,73,72,70,72,73,74)
```

Store the Variable in a data frame

```
fans <- data.frame(cfm)
View(fans)
```

Step 2: Create the Run Chart

```
> require(lolcat)
> spc.run.chart(fans$cfm, main = "Run Chart: Computer Fans", ylab =
"CFM")
```

Step 3: Add a horizontal line

```
> abline(h=72)
```

Other Options for Customization

Point symbol: pch = (1-25)

Point size: cex =

Color: col = “red” (color name or hexadecimal code)

Line type: lty = (0-6)

Line width: lwd =

Sources

The material used in the PowerPoint presentations associated with this course was drawn from a number of sources. Specifically, much of the content included was adopted or adapted from the following previously-published material:

- Luftig, J. An Introduction to Statistical Process Control & Capability. Luftig & Associates, Inc. Farmington Hills, MI, 1982
- Luftig, J. Advanced Statistical Process Control & Capability. Luftig & Associates, Inc. Farmington Hills, MI, 1984.
- Luftig, J. A Quality Improvement Strategy for Critical Product and Process Characteristics. Luftig & Associates, Inc. Farmington Hills, MI, 1991
- Luftig, J. Guidelines for Reporting the Capability of Critical Product Characteristics. Anheuser-Busch Companies, St. Louis, MO. 1994
- Spooner-Jordan, V. Understanding Variation. Luftig & Warren International, Southfield, MI 1996
- Luftig, J. and Petrovich, M. Quality with Confidence in Manufacturing. SPSS, Inc. Chicago, IL 1997
- Littlejohn, R., Ouellette, S., & Petrovich, M. Black Belt Business Improvement Specialist Training, Luftig & Warren International, 2000
- Ouellette, S. Six Sigma Champion Training, ROI Alliance, LLC & Luftig & Warren, International, Southfield, MI 2005