



GeoNeurale

Lichtenbergstrasse 8
D-85748 Munich

MULTIVARIATE STATISTICS FOR GEOPHYSICAL AND PETROPHYSICAL ANALYSIS

Luigi Beghi & Rimantas Eidukevicius

PROGRAM

DAY-1

- Probability: probability spaces
- Conditional probability, Bayes' law,
- Random variables, probability distributions,
- Expected value, variance
- Distributions: Gauss, Uniform, Log-Normal, Bernoulli, Poisson
- Independent random variables
- Functions of random variables

-Examples

-Sampling; empirical probability distribution; law of large numbers; arithmetic mean, median, empirical variance, standard deviation.

Linear bivariate regression ($y = a x + b$), linear correlation coefficient r .
test

-Variance ratio (explained ratio/ residual ratio).

-Related non linear bivariate regressions (exponential and "power" functions).

DAY-2

-Linear Multivariate Regression

-Similarity and Distance Coefficient between Multivariate Variables

DAY-3

-Cluster Analysis

-Sequential agglomerative Cluster Analysis (Dendograms)

-Basic intro to fractals

-Examples

Practical examples of Petrophysical and Geophysical applications are extensively applied in each phase of the course with use of the Software R.

BIOGRAFIES

Luigi Beghi

Prof. Luigi Beghi holds a University Degree in Physics (Laurea in Fisica) from the University of Padua, Italy, and a University degree in Electronic Engineering (Laurea in Ingegneria Elettronica) from the University of Padua, Italy.

1961-1964 Assistant at the Physics Institute " G. Galilei" , University of Padua, Italy

-From October 1, 1964 until October 31, 1967 and from November 1, 1968 until January 1, 1986 : assistant professor, in charge of the course of "Analog calculation" (Calcolo analogico ed Elettronica) at the Department of Mathematics, University of Padua, Italy

-From November 1, 1967 to February 28, 1969 : staff member of the European Space Research Organization at Darmstadt (Federal Republic of Germany)

-From February 1, 1986 up to the present , associated professor of "Calculus" (Istituzioni di Matematiche) and in charge of the course of "Mathematical methods in Biology" (Metodi Matematici e Statistici per la Biologia) at the Faculty of Mathematics and Natural Sciences, University of Padua, Italy

-From the Academic year 1980/81 up to the present , in charge of the course of "Mathematical methods in Medicine" (Scuole di Specializzazione in Medicina Nucleare e Chimica Clinica) at the Faculty of Medicine of the University of Padua, Italy

-Member of the Interdisciplinary Center of Bioengineering (Centro Interdisciplinare per la Bioingegneria) of the University of Padua, Italy

-Member of U.M.I. (Unione Matematica Italiana), A.I.C.A. (Associazione Italiana per il Calcolo Automatico), A.M.S. (American Mathematical Society) , S.I.A.M. (Society for Industrial and Applied Mathematics), S.M.B. (Society for Mathematical Biology), E.S.M.T.B. (European Society for Mathematical and Theoretical Biology), C.S.T.B. (Canadian Society for Theoretical Biology).

-Instructor of Multivariate Statistics at GeoNeurale - Munich

-Actual interests: Multivariate Statistics and Spatial Statistical applications in the Petrophysical and Geophysical Analysis.

-Gigi is the author or the co-author of over 60 publications and technical reports in the areas of numerical calculus, statistical data processing, pattern recognition, biocybernetics and mathematical psychology, as well as the author of the following textbooks :

- L. Beghi "Metodi per lo studio dei sistemi lineari" (Linear systems) , Libreria PICCIN Publ., Padova, pgs 1-251, 1971
- L. Beghi "Sistemi lineari ed elaborazione dei dati"(Linear systems and data processing) , CLEUP Publ., Padova, pgs 1-527, 1979
- L. Beghi "Metodi matematici e statistici per la Biologia"(Mathematical and statistical methods in Biology) , Libreria PROGETTO Publ., Padova, pgs 1-206, 1990

Present research interests

Biomathematics, Statistical Data Processing in Biology and Medicine, Mathematical Psychology and Biocybernetics (visual perception).

Multivariate Statistical applications in the Geophysical and Petrophysical Analysis
- Spatial Statistics and Geo-Simulations Group of GeoNeurale - Munich

Publications in the period 1991-2000

- L. Beghi, E. Xausa, M. Zanforlin "Analytic determination of the depth effect in stereokinetic phenomena without a rigidity assumption" *Biol. Cyber.*, 65, 425-432, 1991
- L. Beghi, E. Xausa, C. De Biasio, M. Zanforlin "Quantitative determination of the 3D appearances of a rotating ellipse without a rigidity assumption" *Biol. Cyber.*, 65, 433-440, 1991
- A. Giacomini, L. Beghi, M. De Paoli, G. Roveroni, F. Galeotti, A. Corsini, M. Plebani "Interpretation of results for tumor markers on the basis of analytical and biological variability " *Journal of Tumor Marker Oncology*, 9, 41, 1994
- M. Plebani, A. Giacomini, L. Beghi, M. De Paoli, G. Roveroni, F. Galeotti, A. Corsini, C.G. Fraser "Serum tumor markers in monitoring patients" *Anticancer research*, 16, 2249-2252, 1996
- L. Beghi, E. Xausa, M. Zanforlin "3-D perception in stereokinetic phenomena" *Research Developments in Biological Cybernetics*, 1, 33-54, 1996
- E. Xausa, L. Beghi, M. Zanforlin "Mathematical model of the depth effect in the translatory alternating movement. Part A : 3-D perception of length amplification" in C. Taddei-Ferretti (editor) *Biocybernetics of vision, integrative mechanisms and cognitive processes*, World Scientific, Singapore, London, New Jersey, Hong Kong , pgs 293-296, 1997
- L. Beghi, E. Xausa, M. Zanforlin "Mathematical model of the depth effect in the translatory alternating movement. Part B :swinging gate phenomenon" in C. Taddei-Ferretti (editor) *Biocybernetics of vision, integrative mechanisms and cognitive processes*, World Scientific, Singapore, London, New Jersey, Hong Kong , pgs 297-300, 1997 L. Beghi, E. Xausa, L. Tomat, M. Zanforlin " The depth effect in an oscillating tilted bar" *Journal of Mathematical Psychology*, 41, 11-18, 1997
- J. Osis, L. Beghi "Topological modelling of biological systems" in D.A. Linkens and E.R. Carson (editors) *Proceedings of the 3rd IFAC Symposium on Modelling and Control in Biomedical Systems*, University of Warwick, 23-26 March 1997, Elsevier Science Publishing, Oxford, pgs 337-342, 1997
- L. Beghi, E. Xausa "The depth effect in an oscillating tilted bar. Part II : mathematical model of depth displacement" In C. Taddei-Ferretti and C. Musio (editors) *Downward processing in the perception representation mechanisms*, World Scientific, Singapore, London, New Jersey, Hong Kong , pgs 329-335, 1998
- L. Beghi, E. Xausa, M. Zanforlin "Mathematical model of the apparent displacement in depth of a vertical contracting bar. Part A : hyperbolic decrements" In C. Taddei-Ferretti and C. Musio (editors) *Neuronal Bases and Psychological Aspects of Consciousness*, World Scientific, Singapore, London, New Jersey, Hong Kong , pgs 399-407, 1999
- E. Xausa, L. Beghi, M. Zanforlin "Mathematical model of the apparent displacement in depth of a vertical contracting bar. Part B :uniform and harmonic decrements" In C. Taddei-Ferretti and C. Musio (editors) *Neuronal Bases and Psychological Aspects of Consciousness*, World Scientific, Singapore, London, New Jersey, Hong Kong , pgs 408-414, 1999
- P. Legovini, J. Osis, A. Giacomini, L. Beghi "Anemia Control in Chronic Renal Failure" in E. Carson and E. Salzsieder (editors) *Proceedings of the 4rd IFAC Symposium on Modelling and Control in Biomedical Systems*, Greifswald, 30 March - 1 April 2000, Pergamon Press, Oxford, pgs 177-182, 2000

Rimantas Eidukevicius

Professor of Mathematics at the University of Vilnius – Lithuania
and at the University of Padua – Italy.

Education / degree:

Mathematics (1973 – 1978), Vilnius University, Vilnius, Lithuania
Doctorial studies (1978 – 1981), Vilnius University, Lithuania
Doctor of Sciences (PhD, 1983) / Mathematics, Vilnius University, Lithuania

Career history:

Computer Centre of Vilnius University, Vilnius, Lithuania: Senior Programmer (1982 – 1992), Head of Mathematical Modelling Group (1992 – 1997)
Various Institutions: Lithuanian Oncology Centre, Lithuanian Military Academy, Vilnius Pedagogical University, Vilnius Technical University (1985 - 2006) – part time
Faculty of Mathematics and Informatics, Vilnius University, Senior Assistant (1998 – 1999)
Faculty of Mathematics and Informatics, Vilnius University, Associated Professor (Docent) (1999 – present)

Scientific research: Mathematical statistics, Mathematics modelling, applications in medicine.

Lecturing on: Mathematical modelling, Mathematical statistics, Statistical packages, Informatics

-Instructor of Multivariate Statistics at GeoNeurale - Munich
-Actual interests: Multivariate Statistics and Spatial Statistical applications in the Petrophysical and Geophysical Analysis.
- Spatial Statistics and Geo-Simulations Group of GeoNeurale - Munich

Publications:

1. R. Eidukevičius, D. Characiejus. Analysis and Mathematical Modeling of Dynamics of Two Tumors System. *Nonlinear Analysis*, 1998, No. 2, pp. 31 - 34.
2. V. Pašukonienė, D. Characiejus, N. Kazlauskaitė, T. Petraitis, V. Lazutka, R. Eidukevičius, M. Mauricas. Lymphocyte subsets, granulocytes and monocytes in advanced renal cell carcinoma. *Acta medica Lituanica Suppl.* 3: 34- 39, 1999.
3. R. Eidukevičius, D. Beresnevičienė, M. Markovienė. Self-esteem, psychological well-being at school and anxiety in middle childhood. *Educational Psychology*, 1999, v. 2, No. 2, p. 13-19 (in Lithuanian).
4. O. Rudzevičienė, I. Narkevičiūtė, R. Eidukevičius. Quantitative changes of bifidobacteria in small children with atopic dermatitis, *Health Sciences*, 2000, Nr. 2, p. 25 – 28.
5. Narkeviciute I., Rudzeviciene O., Leviniene G., Mociskiene K., Eidukevicius R. Management of Lithuanian children's acute diarrhoea with Gastrolit solution and dioctahedral smectite. *Eur J Gastroenterol Hepatol*, 2002, 14: 419-424.
6. Rudzeviciene O., Narkeviciute I., Eidukevicius R. Lactose malabsorption and lactose intolerance in young children with atopic dermatitis. *Health Sciences*, 2002, 1(17), p. 6-10.
7. Rudzeviciene O., Narkeviciute I., Eidukevicius R. Laktazės nepakankamumo laboratorinė diagnostika // *Laboratorinė medicina*. - 2002, 2(14), p. 16-19.
8. I. Narkevičiūtė, J. Bernatienė, A. Mikėlionytė, G. Bernatienė, V. Baliukynaitė, R. Eidukevičius. Aetiological diagnostics of acute bacterial meningitis in children. // *Scandinavian journal of infectious diseases*. ISSN 0036-5548. 2006, vol. 38, no.9, p. 782-787. • S3 : Straipsniai LMT patvirtintose DB
9. R. Janavičius, D. Characiejus, R. Eidukevičius, L. Samsonienė, R. Adomaitienė, J. Juozulynas, J. Prapiestis, A. Lukšienė, Aloyza, A model of the psychosocial environment for integrated education opportunities of the disabled in Lithuania. // *Acta medica Lituanica*. ISSN 1392-0138. 2006, vol. 13, no. 4, p. 281-286.

10. Eidukevičius, Rimantas, Ivanauskas, Feliksas, Pikturna, Aleksas, Vilniaus universiteto finansų modeliavimas. // Lietuvos matematikos rinkinys. ISSN 0132-2818. 2008, t. 48-49, p. 196-199.
 11. F. Ivanauskas, R. Eidukevičius, A. Marčinskas, B. Galinienė, Birutė, Analysis of the housing market in Lithuania. // International journal of strategic property management. ISSN 1648-715X. 2008, vol. 12, no. 4, p. 271-280.
 12. N. Kazlauskaitė, V. Pašukonienė, M. Mauricas. The effect of high dose cyclophosphamide pretreatment on circulating regulatory T cells and tumour growth in murine DBA/2-SL2 lymphoma model. // Acta medica Lituanica. ISSN 1392-0138. 2008, vol. 15, nr. 2, p. 71-75.
 13. K. Mikalauskas, R. Eidukevičius, On selecting the better of two binomial populations. // Lietuvos matematikos rinkinys. ISSN 0132-2818. 2008, t. 48-49, p. 294-298.
 14. D. Characiejus, V. Pašukonienė, J.J.L. Jacobs, R. Eidukevičius, F. Jankevičius, N. Dobrovolskienė, M. Mauricas, R.J.A. van Moorselaar, W. den Otter. Prognostic Significance of Peripheral Blood CD8^{high}CD57⁺ Lymphocytes in Bladder Carcinoma Patients After Intravesical IL-2. // Anticancer research. Kapandriti : International Institute of Anticancer Research. ISSN 0250-7005. 2011, vol. 31, no. 2, p. 699-704.
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GeoNeurale - MUNICH

at the
GATE – Garching Technologie und Gründerzentrum

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LEVEL: Advanced

Audience:

Geophysicists, Petrophysicists, Geologists, Petroleum Engineers, Modeling Specialists

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