

Cosine directions using Rao-Blackwell Theorem and Hausdorff metric in Quasars

Byron E. Bell*

DePaul University, Chicago, USA bbell2851@gmail.com

Abstracts

This analysis will determine the equations of the Cosine Directions for all flux of the Optical Spectrum in quasars. Studies on Hausdorff metric will greatly enhance our understanding of quasars distances. The essential work of J. Bovy and D. Mortlock in the probabilities of quasars will set the methods/process of probability theory in the research along with Fokker-Planck probability theory. This study will complete steps in the classification of quasars by finding the minimum variance of flux by using the Rao-Blackwell Theorem. The papers of C. R. Rao and D. Blackwell will be examined to clarify more of the above theorem.

Keywords: Theory of Flux, Probability Theory of Bovey and Mortlock, Fokker-Planck Probability Theory

1. Introduction: The study of cosine directions using the Rao-Blackwell theorem and Hausdorff metric is needed for the study of quasars. The cosine directions of quasars have been used by used is before by this author (Bell 2010). In this study will occur by using apparent magnitude data transforming it into the rate of energy transfer per unit area and here after will be called just flux. Flux is measured as Watts per square meter ($W \cdot m^{-2}$) per second. The theory of flux will be looked at by cosine directions from a deterministic standpoint and then apply mathematical statistics to the cosine directions equations. Hausdorff metric will be utilized to find distances between quasars from applying mathematical analysis to flux. The work of Bovey and Mortlock leads the way to understanding a new process of analyzing “Big Data” for researchers utilizing probabilistic models in the study of astrostatistics. The Fokker-Planck Probability Theory (FPPT) is a method that finds the probability of variables and time as a factor in the equation. Using the FPPT in this study the probability theory will utilize flux as a variable and redshifts (z) as the factor of influence in the equation. This would lead to a probability of flux in quasars.

2. Results:

Theory of Flux

$$\text{Flux Equation: } f = 2 \times 10^{-2m_o/5} f_o \sinh[(2 \ln(10)/5)(m_o - m)]$$

$$\text{S/N Ratio: } f_{ugriz}/\sigma, m_{ugriz}/\sigma, F_{ugriz}/\sigma, \quad \text{Lupton (1999)}$$

$$f_{ugriz} = \alpha_u f_u + \alpha_g f_g + \alpha_r f_r + \alpha_i f_i + \alpha_z f_z$$

$$f_{ugriz,hat} = \alpha_u f_u + \alpha_g f_g + \alpha_r f_r + \alpha_i f_i + \alpha_z f_z + \epsilon$$

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$$z_{ugriz} = \alpha_u f_u + \alpha_g f_g + \alpha_r f_r + \alpha_i f_i + \alpha_z f_z$$

$$z_{ugriz,hat} = \alpha_u f_u + \alpha_g f_g + \alpha_r f_r + \alpha_i f_i + \alpha_z f_z + \varepsilon$$

Hausdorff Metric

$$d_{HM}(F_u, F_g) = \max \{ \sup_{f_u \in F_u} \inf_{f_g \in F_g} d(f_u, f_g), \sup_{f_g \in F_g} \inf_{f_u \in F_u} d(f_u, f_g) \}, \text{Henrikson (1999)}$$

The Work Probability of Bovy and Mortlock

$$P(\text{fluxes}, z, \text{quasar}) = P(\text{fluxes} \mid z, \text{quasar}) P(z \mid \text{quasar}) P(\text{quasar}) \quad \text{Bovy (2012)}$$

$$P(z \mid \text{fluxes}, \text{quasar}) = P(\text{fluxes}, z, \text{quasar}) / [P(\text{fluxes}, \text{quasar})]$$

$$P(\text{quasar in } \Delta z / \text{fluxes}) = \int_{\Delta z} P(\text{quasar}, z \mid \text{fluxes}) dz$$

$$P(\text{fluxes}) = P(\text{fluxes}, \text{quasar}) + P(\text{fluxes}, \text{not a quasar})$$

$$P(f_{ugriz}, m_{ugriz} \mid z) \quad \text{Mortlock (2012)}$$

$$W_z(f_{ugriz}, m_{ugriz})$$

$$W_q(f_{ugriz,hat}, m_{ugriz})$$

$$P(z \mid f_{ugriz,hat}, z_{hat}, m_{ugriz})$$

Fokker-Planck Probability Theory, Fokker (1914), Planck (1917), Fengler (2008)

$\partial_z h = - \sum \partial_b [D_b(f_{ugriz})h] + \sum \sum \partial_{b,c}^2 [D_{bc}(f_{ugriz})h]$ Where b is a column of flux data and c is an adjacent column of flux data, where D_b is a drift vector and D_{bc} is a diffusion tensor. Where h is the Fokker-Planck Equation.

$$\text{SDE } d\mathbf{F}_{ugriz} = \boldsymbol{\mu}(\mathbf{F}_{ugriz}, z) dz + \boldsymbol{\sigma}(\mathbf{F}_{ugriz}, z) d\mathbf{W}_{ugriz}$$

Rao-Blackwell Theorem

$$\Theta = \int g(F) \Phi(F, \Theta) dF \quad \text{Rao (1945)}$$

$$\text{Var}(g(F)) = \int g(F) \Phi(F, \Theta) dF$$

$$E(f_u - \Theta_u)(f_g - \Theta_g) = V_{ug}$$

The distance of two populations

Minimum variance and the estimation of several parameters, Rao (1946)

Conditional expectation and unbiased sequential estimation, Blackwell (1947).

3. Conclusions: The above items will be presented at the 59th World Congress of Statistics (WCS) of the International Statistical Institute (ISI) in Hong Kong, China August 2013 with data.

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