Glaucoma, progressive optic neuropathy often associated with increased intraocular pressure, is the second leading cause of irreversible vision loss worldwide. It has been estimated that about 50% of patients are unaware of their glaucoma and for this reason diagnosis is frequently delayed. There exist a number of tests supporting glaucoma diagnosis but none of them provides sufficient data by itself to reliably detect the condition. Hence, continuing efforts are being made to develop efficient and non-invasive methods of early stage glaucoma detection. Optical coherence tomography (OCT) has led to significant advancement in knowledge and understanding of glaucoma, particularly when high-resolution imaging of the optic nerve and anterior chamber angles had become available. However, no attention has been given to corneal OCT imaging for glaucoma diagnosis. A recent discovery of the Principal Investigator's team, associated with OCT corneal imaging, in which the OCT speckle (a kind of noise) has been treated as the source of information, showed differences in statistical properties of the corneal speckle between patients with glaucoma, glaucoma suspects and healthy controls. This phenomenon is the main motivation for tackling the scientific problem in the proposed project, which goal is to find the origin of variations observed in the corneal OCT speckle and their link to glaucoma. The research plan involves building statistical model of corneal speckle including aspects related to OCT settings as well as the biomechanical and optical properties of cornea. To examine the response of an eye globe to induced variations in intraocular pressure ex-vivo studies will be conducted on animal (porcine) eyes. The study will include the influence of biomechanical and optical parameters of the cornea as well as the biometrics of the eye globe. Findings from ex-vivo studies will contribute the validation and extension of the corneal OCT speckle model. Finally, noninvasive in–vivo studies will be conducted on glaucoma patients and healthy subjects to explore the utility of the model parameters for supporting glaucoma diagnosis. Realization of the project leads to advance currently inaccessible knowledge on the corneal microstructure of glaucomatous eye and provides substantial impact on understanding of the nature of glaucoma.