**LEGENDS FOR SUPPLEMENTARY FIGURES**

**Supplementary Figure S1.** Boxplots depict distinct pathway activities between the subtypes. Red, green, and blue colors refer to PCS1, PCS2, and PCS3, respectively. \*\*P<0.01, and \*P<0.05.

**Supplementary Figure S2.** Differential enrichment of a benign prostate specific gene signature. Significant different of all the subtypes from benign tissue were examined using the Wilcoxon Rank-Sum test \*\*P<0.001.

**Supplementary Figure S3.** Correlation of the PCS categories with clinical outcomes in individual cohorts displayed by Kaplan-Meier survival curves. A-E. Metastasis-free survival between the subtypes in MAYO1, MAYO2, TJU, CCF, and JHM. F-I. PC specific mortality in MAYO1, MAYO2, CCF, and JHM. J. overall survival in SWD cohort. Red, green, and blue lines indicate PCS1, PCS2, and PCS3 categories, respectively. Significance of survival was examined by Cox proportional hazard regression and chi-square test. Table below the survival curve depicts number of patients in each category.

**Supplementary Figure S4.** Selection of the 37-gene panel. A. Schematic diagram depicting the selection steps of 37 essential genes for robust classification. B. The performance by comparing mean squared error (MSE) obtained by classification for a reduced model with 37 selected genes and the full model with 428 genes.