# COMPLEX ANALYSIS SEMINAR

## HOLOMORPHIC EMBEDDINGS OF SMALL CODIMENSION IN COMPLEX PROJECTIVE SPACES

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**ABSTRACT**: After having reviewed some basic constructions related to holomorphic embeddings of compact Riemann surfaces and (algebraic) complex manifolds, I will introduce the long standing conjecture of Hartshorne about small codimension embeddings and its relation with splitting of vector bundles and projective geometry. According to Hartshone's conjecture, a complex submanifold $X^k$ of dimension $k$ in $\mathbb{P}^n(\mathbb{C})$ of small codimension (how small depends on $n$ and $k$) is always a complete intersection, namely the homogenous ideal $I(X^k)$ of $X^k$ is generated by $n-k$ homogeneous polynomials. From the differential geometric point of view, being a complete intersection entails that it is possible to find $n-k$ hypersurfaces, possibly singular, such that: 1) on $X^k$ they are smooth, 2) their set-theoretic intersection is $X^k$ and 3) they meet transversally at $X^k$. Complete intersections are very well understood, and from this point of view Hartshorne's conjecture states that the only complex submanifolds of small codimension in $\mathbb{P}^n(\mathbb{C})$ are the trivial ones. I will also present my past contributions to this problem and I will briefly review the various approaches that have been tried so far to settle this question.

**Date:** Thursday, April 07, 2011

**Time:** 4pm-5pm

**Place:** UH 4440

**Webpage:** `http://math.utoledo.edu/~sonmez/complexseminar.html`