

## Contents

### *EMturboGAMP Software Package v0.1*

Filename	File Type	Description
add2path.m	Accessory script	Simple script for adding all of the folders needed to obtain full-functionality from the EMturboGAMP package to MATLAB®'s path
contents.pdf	PDF document	This file; lists and briefly describes all the files included in the EMturboGAMP v0.1 package
manuscript.pdf	PDF document	Most recent EMturboGAMP publication, for reference
README	Text file	Contains useful information about the package
<b>ClassDefs folder</b>		
AmplitudeConcat.m	Class Definition	Container class that allows one to combine multiple AmplitudeStruct class objects over different subsets of coefficients.
AmplitudeStruct.m	Class definition	Defines an abstract class from which all concrete classes that describe a particular form of amplitude structure (i.e., structure in the amplitudes of the non-zero signal coefficients) must inherit.
BernGauss.m	Class definition	Defines a concrete class that inherits from the Signal abstract class, specifying a signal model in which each signal coefficient is marginally Bernoulli-Gaussian distributed.
BernLaplace.m	Class definition	Defines a concrete class that inherits from the Signal abstract class, specifying a signal model in which each signal coefficient is marginally Bernoulli-Laplacian distributed.
ElasticNet.m	Class definition	Defines a concrete class that inherits from the Signal abstract class, specifying a signal model in which a regularization penalty is applied to the input signal consisting of weighted ell-1 and ell-2 penalties.
GAMPState.m	Class definition	Defines a container class used internally by EMturboGAMP to exchange information between TurboOpt and GAMP.
GaussMarkov.m	Class Definition	Defines a concrete class that inherits from the AmplitudeStruct abstract class, specifying a form of amplitude correlation in which neighboring amplitudes constitute a first-order Gauss-Markov process.
GaussMix.m	Class Definition	Defines a concrete class that inherits from the Signal abstract class, specifying a signal model in which each signal coefficient is marginally Bernoulli-Gaussian-mixture distributed.
GaussMixNoise.m	Class Definition	Defines a concrete class that inherits from the Observation abstract class, specifying an observation channel in which measurements are corrupted by noise that obeys a binary Gaussian mixture distribution.
GaussNoise.m	Class Definition	Defines a concrete class that inherits from the Observation abstract class, specifying an observation channel in which measurements are corrupted by additive white Gaussian noise (AWGN).
GenParams.m	Class Definition	Defines a container class used to hold parameters needed when generating synthetic data that obeys a desired distribution.
JointSparse.m	Class Definition	Defines a concrete class that inherits from the SupportStruct abstract class, specifying a support structure in which signal coefficients are jointly sparse (i.e., a time-invariant signal support).
Laplacian.m	Class Definition	Defines a concrete class that inherits from the Signal abstract class, specifying a signal model in which each signal coefficient is marginally Laplacian distributed.

MarkovChain1.m	Class Definition	Defines a concrete class that inherits from the SupportStruct abstract class, specifying a support structure in which the signal support obeys a first-order Markov chain across either columns or rows of a signal matrix $X$ .
MarkovChainD.m	Class Definition	Defines a concrete class that inherits from the SupportStruct abstract class, specifying a support structure in which signal coefficients which are drawn from $D$ active mixture components (specified by the choice of Signal class object) follow $D$ independent first-order Markov chains across either columns or rows of a signal matrix $X$ .
MarkovField.m	Class Definition	Defines a concrete class that inherits from the SupportStruct abstract class, specifying a support structure in which signal coefficients occupy a 2D grid, and an Ising prior (Markov random field) governs the correlation between neighboring coefficients
MarkovField3D.m	Class Definition	Defines a concrete class that inherits from the SupportStruct abstract class, specifying a support structure in which signal coefficients occupy a 3D volume, and an Ising prior (Markov random field) governs the correlation between neighboring coefficients
NoSupportStruct.m	Class Definition	Defines a concrete class that inherits from the SupportStruct abstract class, and describes a signal model in which there is no structure present in the support of the signal.
NoAmplitudeStruct.m	Class definition	Defines a concrete class that describes a signal model in which there is no structure present in the amplitudes of the signal.
Observation.m	Class Definition	Defines an abstract class from which all concrete classes that describe a particular observation channel model must inherit and extend.
RunOptions.m	Class Definition	Defines a container class that holds parameters that govern the runtime behavior of EMTurboGAMP
Signal.m	Class Definition	Defines an abstract class from which all concrete classes that describe a particular marginal signal coefficient distribution must inherit and extend.
SignalConcat.m	Class Definition	Container class that allows one to combine multiple Signal class objects over different subsets of coefficients.
SupportConcat.m	Class Definition	Container class that allows one to combine multiple SupportStruct class objects over different subsets of coefficients.
SupportStruct.m	Class Definition	Defines an abstract class from which all concrete classes that describe a particular form of structured sparsity (i.e., structure in the support of the sparse signal) must inherit.
Template.m	Class Definition	Defines a basic template class definition file that can be used to create new concrete classes.
TurboOpt.m	Class Definition	A container class that holds concrete objects of the Signal, Observation, AmplitudeStruct (optionally), SupportStruct (optionally), and RunOptions (optionally) classes. Collectively, the properties of this TurboOpt object both define a particular structured probabilistic signal model and proscribe the manner in which EMTurboGAMP is to be executed.
<b>Functions folder</b>		
EMturboGAMP.m	Primary function	This is the main function that is called for performing a recovery, given observations, a linear transform operator, and an object of the TurboOpt class that defines the probabilistic model.
nser.m	Accessory function	Computes the normalized support error rate (NSER)

RunOptions.m	Class Definition	Defines a container class that holds parameters that govern the runtime behavior of EMturboGAMP
signal_gen_fxn.m	Primary function	This function can be called in order to generate a realization of a synthetic dataset according to statistics that are defined by a TurboOpt object that is given as an input, as well as an object of the GenParams class.
<b>Tests folder</b>		
<b>AudioCS sub-folder</b>		
gen_block.m	Accessory script	Script used by Mar_28_2012_test.m
Mar_28_2012_test.m	Test script	Test script that recovers a compressively sampled audio signal using EMturboGAMP for a variety of different models of signal structure. Uncomment different class declaration lines to try out different models.
moz1_11kHz.wav	Data file	Audio signal
<b>Demo folder</b>		
TestEMturboGAMP.m	Demo script	Demonstrates how to construct different structured signal models by creating TurboOpt objects with different properties. By uncommenting different class declaration lines (denoted in the code), one can explore how EMturboGAMP recovers data generated synthetically according to the specified structured signal model.