After studying modern literature at the University of Rouen, drama (Théâtre de l'Abordage / Théâtre du Damier), and then Art History at the École du Louvre -Paris, Marie Gautrot was admitted to the CNSMDP – the Conservatoire National Supérieur de Musique et de Danse de Paris.

She has performed in roles such as Djamileh (Bizet) at the Théâtre de Compiègne, Public Opinion (Offenbach's Orphée aux Enfers) at the Aix-en-Provence Festival, Cherubino (Le Nozze di Figaro by Mozart) at the Opéra de Versailles, Marie (L'Enfance du Christ by Berlioz) at the Opéra d'Avignon, Marguerite (La Damnation de Faust by Berlioz) at the Théâtre du Châtelet and the Opéra de Rouen, Ramiro (La Finta Giardiniera by Mozart) and Dorabella (Così fan tutte by Mozart) at the Opéra de Toulon, Amneris (Aida by Verdi), Nicklausse (Les Contes d'Hoffmann by Offenbach) in Grenoble, Maddalena (Rigoletto by Verdi) at the Opéra de Limoges, the Voice of the Mother (Les Contes d'Hoffmann) in Tokyo and at the Opéra de Lyon. She also performed as Giovanna (Rigoletto) at the Paris National Opera, Clairon (Capriccio by Strauss) and Madame Larina (Eugene Onegin by Tchaikovsky) at the Opéra de Metz, Orlovsky (Die Fledermaus by Strauss) at the Opéra de Marseille, Albine (Thaïs by Massenet) at the Opéra de Monte-Carlo, the Nun (La Nonne sanglante by Gounod) at the Opéra de Saint-Étienne, Azucena (Il Trovatore by Verdi) at the Linière Festival, and Emilia (Otello by Verdi) at the Paris National Opera.

In concert, she has appeared in works such as St. Matthew Passion by Bach, Verdi's Requiem, Duruflé's Requiem, Rossini's Petite Messe Solennelle, Mahler's Kindertotenlieder and Das Lied von der Erde, Berlioz's Les Nuits d'été, Beethoven's Ninth Symphony, Chausson's Poème de l'Amour et de la Mer, and Monteverdi's Madrigals (recorded with Les Arts Florissants).

Recently, she has performed as the Marquise de Berkenfield (La Fille du Régiment by Donizetti) at the Opéra de Monte-Carlo, Fenena (Nabucco by Verdi) at the Opéra de Marseille, Catarina (Fausto by Bertin) at the Théâtre des Champs-Élysées, the title role in La Belle Hélène (Offenbach) at the Osarques Festival, the title role in Carmen (Bizet) at the Estonian National Opera, and the Forester's Wife (The Cunning Little Vixen by Janáček) at the Paris National Opera.

She achieved great acclaim for her debut as Dalila (Samson et Dalila by Saint-Saëns) at the Opéra d'Avignon – a signature role she reprises this season at the Opéra de Saint-Étienne. Upcoming engagements include three productions of Carmen (title role) at the Baalbek Festival (Lebanon), the Trapani Festival (Sicily), and in Hong Kong, as well as Geneviève (Pelléas et Mélisande by Debussy) at the Opéra de Monte-Carlo.